

Radioframe Networks, Inc.

MC Series

December 01, 2004

Report No. RAFN0042

Report Prepared By



www.nwemc.com
1-888-EMI-CERT

© 2004 Northwest EMC, Inc

EMC Test Report



22975 NW Evergreen Parkway
Suite 400
Hillsboro, Oregon 97124

Certificate of Test
Issue Date: December 01, 2004
Radioframe Networks, Inc.
Model: MC Series

Specification	Emissions		
	Test Method	Pass	Fail
FCC 15.107 AC Powerline Conducted Emissions (Receive Mode):2004	ANSI C63.4:2003	<input checked="" type="checkbox"/>	<input type="checkbox"/>
FCC 15.109 Radiated Emissions (Receive Mode):2004	ANSI C63.4:2003	<input checked="" type="checkbox"/>	<input type="checkbox"/>
FCC 15.111 Conducted Spurious Emissions (Receive Mode):2004	ANSI C63.4:2003	<input checked="" type="checkbox"/>	<input type="checkbox"/>
FCC 90.217 and FCC 2.1055 Frequency Stability:2004	TIA/EIA-603:2001	<input checked="" type="checkbox"/>	<input type="checkbox"/>
FCC 90.691 Occupied Bandwidth / Emission Mask:2004	TIA/EIA-603:2001	<input checked="" type="checkbox"/>	<input type="checkbox"/>
FCC 90.217 and FCC 2.1046 Output Power:2004	TIA/EIA-603:2001	<input checked="" type="checkbox"/>	<input type="checkbox"/>
FCC 90.691 and FCC 2.1051 Spurious Conducted Emissions:2004	TIA/EIA-603:2001	<input checked="" type="checkbox"/>	<input type="checkbox"/>
FCC 90.691 and FCC 2.1053 Spurious Radiated Emissions:2004	TIA/EIA-603:2001	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Modifications made to the product
 See the Modifications section of this report

Test Facility

- The measurement facility used to collect the data is located at:
 Northwest EMC, Inc.; 22975 NW Evergreen Parkway, Suite 400; Hillsboro, OR 97124
 Phone: (503) 844-4066 Fax: 844-3826
 This site has been fully described in a report filed with and accepted by the FCC (Federal Communications Commission) and Industry Canada.

Approved By:

 Don Facteau, IS Manager

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America.

Product compliance is the responsibility of the client, therefore the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. This Report may only be duplicated in its entirety. The results of this test pertain only to the sample(s) tested, the specific description is noted in each of the individual sections of the test report supporting this certificate of test.

Revision Number	Description	Date	Page Number
00	None		

FCC: Accredited by NVLAP for performance of FCC radio, digital, and ISM device testing. Our Open Area Test Sites, certification chambers, and conducted measurement facilities, have been fully described in reports filed with the FCC and accepted by the FCC in letters maintained in our files. Northwest EMC has been accredited by ANSI to ISO / IEC Guide 65 as a product certifier. We have been designated by the FCC as a Telecommunications Certification Body (TCB). This allows Northwest EMC to certify transmitters to FCC specifications in accordance with 47 CFR 2.960 and 2.962.



NVLAP: Northwest EMC, Inc. is recognized under the United States Department of Commerce, National Institute of Standards and Technology, National Voluntary Laboratory Accreditation Program for satisfactory compliance with the requirements of ISO/IEC 17025 for Testing Laboratories. The NVLAP accreditation encompasses Electromagnetic Compatibility Testing in accordance with the European Union EMC Directive 89/336/EEC, ANSI C63.4, MIL-STD 461E, DO-160D and SAE J1113. Additionally, Northwest EMC is accredited by NVLAP to perform radio testing in accordance with the European Union R&TTE Directive 1999/5/EEC, the requirements of FCC, and the RSS radio standards for Industry Canada.



200629-0
200630-0
200676-0

Industry Canada: Accredited by NVLAP for performance of Industry Canada RSS and ICES testing. Our Open Area Test Sites and certification chambers comply with RSS 212, Issue 1 (Provisional) and have been filed with Industry Canada and accepted. Northwest EMC has been accredited by ANSI to ISO / IEC Guide 65 as a product certifier. We have been designated by NIST and recognized by Industry Canada as a Certification Body (CB) per the APEC Mutual Recognition Arrangement (MRA). This allows Northwest EMC to certify transmitters to Industry Canada technical requirements.



CAB: Designated by NIST and validated by the European Commission as a Conformity Assessment Body (CAB) to conduct tests and approve products to the EMC directive and transmitters to the R&TTE directive, as described in the U.S. - EU Mutual Recognition Agreement



TÜV Product Service: Included in TÜV Product Service Group's Listing of Recognized Laboratories. It qualifies in connection with the TÜV Certification after Recognition of Agent's Testing Program for the product categories and/or standards shown in TÜV's current Listing of CARAT Laboratories available from TÜV. A certificate was issued to represent that this laboratory continues to meet TÜV's CARAT Program requirements. Certificate No. USA0401C



TÜV Rheinland: Authorized to carryout EMC tests by order and under supervision of TÜV Rheinland. This authorization is based on "Conditions for EMC-Subcontractors" of November 1992.



NEMKO: Assessed and accredited by NEMKO (Norwegian testing and certification body) for European emissions and immunity testing. As a result of NEMKO's laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification (Authorization No. ELA 119).



Technology International: Assessed in accordance with ISO Guide 25 defining the general international requirements for the competence of calibration and testing laboratories and with ITI assessment criteria LACO196. Based upon that assessment Interference Technology International, Ltd., has granted approval for specifications implementing the EU Directive on EMC (89/336/EEC and amendments). The scope of the approval was provided on a Schedule of Assessment supplied with the certificate and is available upon request.



Australia/New Zealand: The National Association of Testing Authorities (NATA), Australia has been appointed by the ACA as an accreditation body to accredit test laboratories and competent bodies for EMC standards. Accredited test reports or assessments by competent bodies must carry the NATA logo. Test reports made by an overseas laboratory that has been accredited for the relevant standards by an overseas accreditation body that has a Mutual Recognition Agreement (MRA) with NATA are also accepted as technical grounds for product conformity. The report should be endorsed with the respective logo of the accreditation body. (NVLAP)



VCCI: Accepted as an Associate Member to the VCCI, Acceptance No. 564. Conducted and radiated measurement facilities have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. (Registration Nos. - Hillsboro: C-1071 and R-1025, Irvine: C-2094 and R-1943, Newberg: C-1877 and R-1760, Sultan: R-871, C-1784 and R-1761)



BSMI: Northwest EMC has been designated by NIST and validated by C-Taipei (BSMI) as a CAB to conduct tests as described in the APEC Mutual Recognition Agreement. License No.SL2-IN-E-1017.



GOST: Northwest EMC, Inc. has been assessed and accredited by the Russian Certification bodies Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC, to perform EMC and Hygienic testing for Information Technology Products. As a result of their laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification



SCOPE

For details on the Scopes of our Accreditations, please visit:

<http://www.nwemc.com/scope.asp>

What is measurement uncertainty?

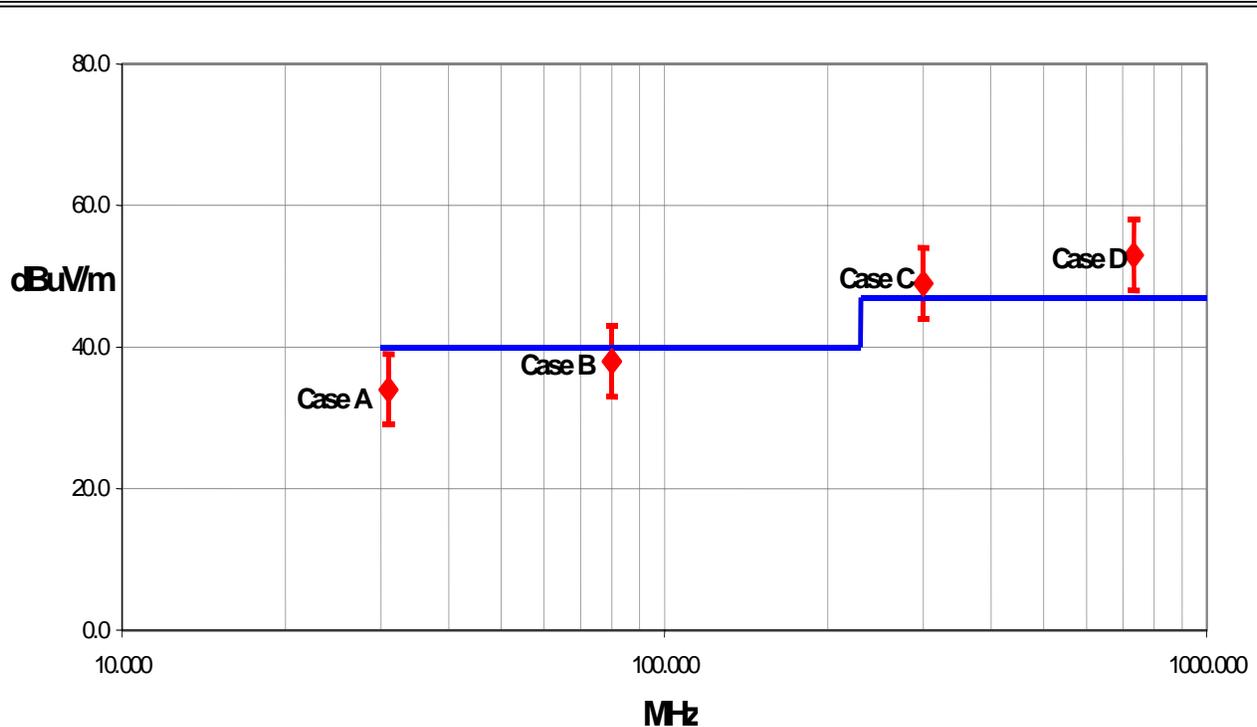
When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. The following statement of measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" value. In the case of transient tests (ESD, EFT, Surge, Voltage Dips and Interruptions), the test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements.

The following documents were the basis for determining the uncertainty levels of our measurements:

- "ISO Guide to the Expression of Uncertainty in Measurements", October 1993
- "NIS81: The Treatment of Uncertainty in EMC Measurements", May 1994
- "IEC CISPR 16-3 A1 f1 Ed.1: Radio-interference measurements and statistical techniques", December 2000

How might measurement uncertainty be applied to test results?

If the diamond marks the measured value for the test and the vertical bars bracket the range of + and - measurement uncertainty, then test results can be interpreted from the diagram below.



Test Result Scenarios:

Case A: Product complies.

Case B: Product conditionally complies. It is not possible to say with 95% confidence that the product complies.

Case C: Product conditionally does not comply. It is not possible to say with 95% confidence that the product does not comply.

Case D: Product does not comply.

Radiated Emissions ≤ 1 GHz

Value (dB)

Test Distance	Probability Distribution	Biconical Antenna		Log Periodic Antenna		Dipole Antenna	
		3m	10m	3m	10m	3m	10m
Combined standard uncertainty $u_c(y)$	normal	+ 1.86	+ 1.82	+ 2.23	+ 1.29	+ 1.31	+ 1.25
		- 1.88	- 1.87	- 1.41	- 1.26	- 1.27	- 1.25
Expanded uncertainty U (level of confidence ≈ 95%)	normal (k=2)	+ 3.72	+ 3.64	+ 4.46	+ 2.59	+ 2.61	+ 2.49
		- 3.77	- 3.73	- 2.81	- 2.52	- 2.55	- 2.49

Radiated Emissions > 1 GHz

Value (dB)

Test Distance	Probability Distribution	Without High Pass Filter		With High Pass Filter	
		3m	10m	3m	10m
Combined standard uncertainty $u_c(y)$	normal	+ 1.29	+ 1.38	- 1.25	- 1.35
		- 1.25	- 1.35	+ 2.57	+ 2.76
Expanded uncertainty U (level of confidence ≈ 95%)	normal (k=2)	+ 2.57	+ 2.76	- 2.51	- 2.70
		- 2.51	- 2.70		

Conducted Emissions

	Probability Distribution	Value (+/- dB)
Combined standard uncertainty $u_c(y)$	normal	1.48
Expanded uncertainty U (level of confidence ≈ 95 %)	normal (k = 2)	2.97

Radiated Immunity

	Probability Distribution	Value (+/- dB)
Combined standard uncertainty $u_c(y)$	normal	1.05
Expanded uncertainty U (level of confidence ≈ 95 %)	normal (k = 2)	2.11

Conducted Immunity

	Probability Distribution	Value (+/- dB)
Combined standard uncertainty $u_c(y)$	normal	1.05
Expanded uncertainty U (level of confidence ≈ 95 %)	normal (k = 2)	2.10

Legend

$u_c(y)$ = square root of the sum of squares of the individual standard uncertainties

U = combined standard uncertainty multiplied by the coverage factor: k . This defines an interval about the measured result that will encompass the true value with a confidence level of approximately 95%. If a higher level of confidence is required, then $k=3$ (CL of 99.7%) can be used. Please note that with a coverage factor of one, $u_c(y)$ yields a confidence level of only 68%.



California

Orange County Facility

Labs OC01 – OC13

41 Tesla Ave.
Irvine, CA 92618
(888) 364-2378
FAX (503) 844-3826



Oregon

Evergreen Facility

Labs EV01 – EV10

22975 NW Evergreen Pkwy.,
Suite 400
Hillsboro, OR 97124
(503) 844-4066
FAX (503) 844-3826



Oregon

Trails End Facility

Labs TE01 – TE03

30475 NE Trails End Lane
Newberg, OR 97132
(503) 844-4066
FAX (503) 537-0735



Washington

Sultan Facility

Labs SU01 – SU07

14128 339th Ave. SE
Sultan, WA 98294
(888) 364-2378
FAX (360) 793-2536

Party Requesting the Test

Company Name:	Radioframe Networks, Inc.
Address:	1120 112th Ave NE, Suite 600
City, State, Zip:	Bellevue, WA 98004
Test Requested By:	Steve Peters
Model:	MC Series
First Date of Test:	08-03-2004
Last Date of Test:	10-20-2004
Receipt Date of Samples:	08-03-2004 and 10-20-2004
Equipment Design Stage:	Pre-Production
Equipment Condition:	No visual damage.

Information Provided by the Party Requesting the Test

Clocks/Oscillators:	Not provided.
I/O Ports:	Antenna Transmit, Antenna Receive, Antenna diversity, Clock in, Ethernet, RS-232 maintenance ports, Tx/Rx test ports, Tx/RX diversity test ports,

Functional Description of the EUT (Equipment Under Test):

Microcell cellular base station for iDEN radio.

Client Justification for EUT Selection:

The product is an engineering sample, representative of the final product.

Client Justification for Test Selection:

These tests satisfy the requirements for FCC part 90.691, 15.107, 15.109, and 15.111

EUT Photo

Equipment modifications					
Item	Test	Date	Modification	Note	Disposition of EUT
1	Frequency Stability	08/03/2004	No EMI suppression devices were added or modified during this test.	Tested at client facility	EUT remained at client facility
2	Output Power	08/03/2004	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.	EUT remained at client facility
3	Spurious Conducted Emissions	08/03/2004	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.	EUT remained at client facility
4	Occupied Bandwidth	08/03/2004	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.	EUT remained at client facility
5	Radiated Emissions – Receive mode	10/19/2004	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.	EUT remained at Northwest EMC.
6	AC Powerline Conducted Emissions	10/19/2004	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.	EUT remained at Northwest EMC.
7	Radiated Spurious (Out of Band) Emissions	10/20/2004	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.	EUT remained at Northwest EMC.
8	Spurious Conducted Emissions – Receive mode	10/20/2004	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.	EUT was returned to client following testing.

Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. All of the EUT parameters listed below were investigated. This includes, but may not be limited to, CPU speeds, video resolution settings, operational modes, and input voltages.

Operating Modes Investigated:

Receive mode, 20 channels configuration

Power Input Settings Investigated:

-48VDC

Software\Firmware Applied During Test

Operating system	VX Works	Version	Unknown
Exercise software	FCC Script	Version	Unknown
Description			
FCC script is a text file of commands run from a remote pc through ftp server that sets the radios to transmit. Without running the script, the unit automatically goes into receive mode.			

EUT and Peripherals in Test Setup Boundary

Description	Manufacturer	Model/Part Number	Serial Number
iDEN Radio Base Station	Radio Frame Networks, Inc.	MC Series System	Engineering Production Unit #1
Subset of MC Series System	Radio Frame Networks, Inc.	PDU	Unknown
Subset of MC Series System	Radio Frame Networks, Inc.	RF Shelf	Unknown
Subset of MC Series System	Radio Frame Networks, Inc.	Radio Blade Shelf	Unknown
Subset of MC Series System	Radio Frame Networks, Inc.	Base Interface Chassis (BIC)	Unknown
Subset of MC Series System	Radio Frame Networks, Inc.	Airlink Interface Chassis (AIC)	Unknown

Remote Equipment Outside of Test Setup Boundary

Description	Manufacturer	Model/Part Number	Serial Number
Clock Source	Motorola	Unknown	Unknown

Equipment isolated from the EUT so as not to contribute to the measurement result is considered to be outside the test setup boundary.

Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Clock Source	Yes	5.0	No	Base Interface Chassis (BIC)	Clock Source
DC Power	No	6	No	PDU	DC Power

PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
LISN	Solar	9252-50-R-24-BNC	LIN	12/16/2003	13 mo
High Pass Filter	TTE	H97-100k-50-720B	HFC	02/01/2004	13 mo
Quasi-Peak Adapter	Hewlett-Packard	85650A	AQF	12/23/2003	13 mo
Spectrum Analyzer	Hewlett-Packard	8566B	AAL	12/23/2003	13 mo
Spectrum Analyzer Display	Hewlett Packard	85662A	AALD	12/23/2003	13 mo

Test Description

Using the mode of operation and configuration noted within this report, conducted emissions tests were performed. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 50 Ω measuring port is terminated by a 50 Ω EMI meter or a 50 Ω resistive load. All 50 Ω measuring ports of the LISN are terminated by 50 Ω .

Measurement Bandwidths

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 – 0.15	1.0	0.2	0.2
0.15 – 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

Measurements were made using the bandwidths and detectors specified. No video filter was used.

Completed by:


EUT:	MC Series	Work Order:	RAFN0042
Serial Number:	N/A	Date:	10/19/04
Customer:	Radioframe Networks, Inc.	Temperature:	70
Attendees:	none	Humidity:	45%
Cust. Ref. No.:	N/A	Barometric Pressure:	29.61
Tested by:	Holly Ashkannejhad	Power:	-48VDC
		Job Site:	EV01

TEST SPECIFICATIONS	
Specification:	FCC 15.107 Class A
Method:	ANSI C63.4
Year:	2003
Year:	2003

SAMPLE CALCULATIONS	
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation	
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator	

COMMENTS

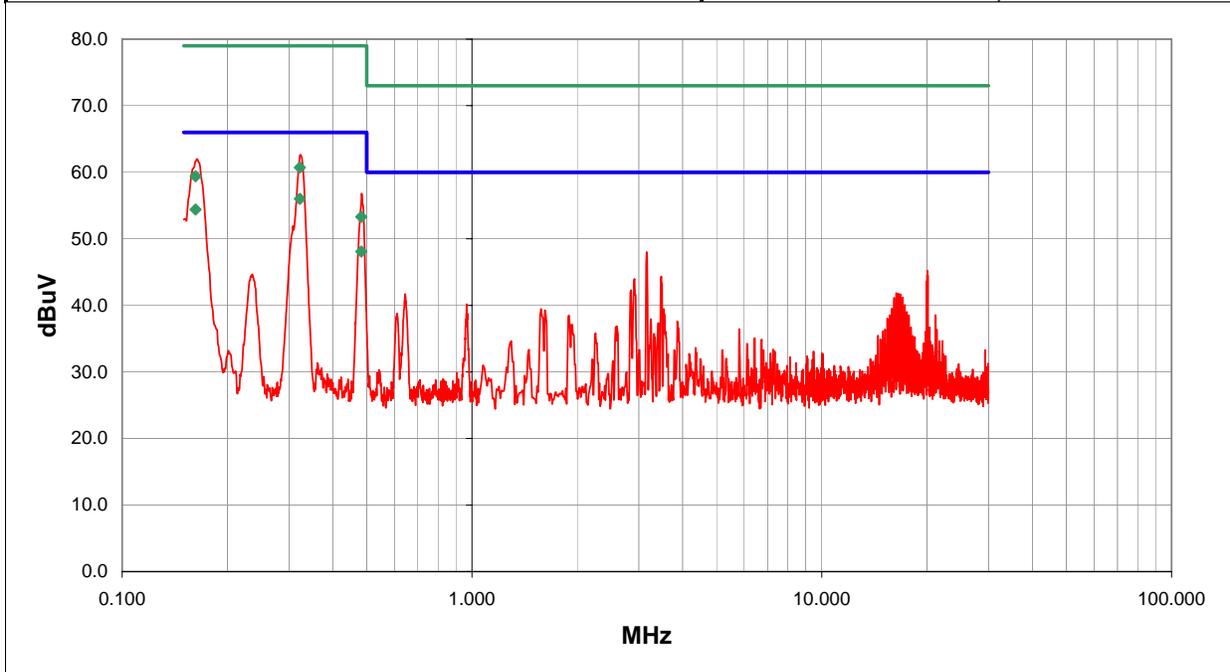
EUT OPERATING MODES
20 channels receiving

DEVIATIONS FROM TEST STANDARD
No deviations.

RESULTS	Line	Run #
Pass	Neg	3

Other


 Tested By:



Freq (MHz)	Amplitude (dBuV)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Detector (blank equal peaks [PK] from scan)	Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.322	36.0	0.0	0.0	20.0	AV	56.0	66.0	-10.0
0.162	34.4	0.0	0.0	20.0	AV	54.4	66.0	-11.6
0.483	28.1	0.0	0.0	20.0	AV	48.1	66.0	-17.9
0.322	40.7	0.0	0.0	20.0	QP	60.7	79.0	-18.3
0.162	39.4	0.0	0.0	20.0	QP	59.4	79.0	-19.6
0.483	33.3	0.0	0.0	20.0	QP	53.3	79.0	-25.7
0.324	42.5	0.0	0.1	20.0		62.6	66.0	-3.4
0.164	41.9	0.0	0.1	20.0		62.0	66.0	-4.0
0.484	36.6	0.0	0.2	20.0		56.8	66.0	-9.2
3.156	27.5	0.0	0.5	20.0		48.0	60.0	-12.0
20.064	23.9	0.0	1.3	20.0		45.2	60.0	-14.8
20.012	23.3	0.0	1.3	20.0		44.6	60.0	-15.4
20.088	23.2	0.0	1.3	20.0		44.5	60.0	-15.5
20.076	23.2	0.0	1.3	20.0		44.5	60.0	-15.5
3.476	23.8	0.0	0.5	20.0		44.3	60.0	-15.7
20.052	23.0	0.0	1.3	20.0		44.3	60.0	-15.7
2.916	23.5	0.0	0.5	20.0		44.0	60.0	-16.0
20.001	22.4	0.0	1.3	20.0		43.7	60.0	-16.3
20.034	21.9	0.0	1.3	20.0		43.2	60.0	-16.8

EUT:	MC Series	Work Order:	RAFNO042
Serial Number:	N/A	Date:	10/19/04
Customer:	Radioframe Networks, Inc.	Temperature:	70
Attendees:	none	Humidity:	45%
Cust. Ref. No.:	N/A	Barometric Pressure:	29.61
Tested by:	Holly Ashkannejhad	Power:	-48VDC
		Job Site:	EV01

TEST SPECIFICATIONS	
Specification:	FCC 15.107 Class A
Method:	ANSI C63.4
Year:	2003
Year:	2003

SAMPLE CALCULATIONS	
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation	
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator	

COMMENTS

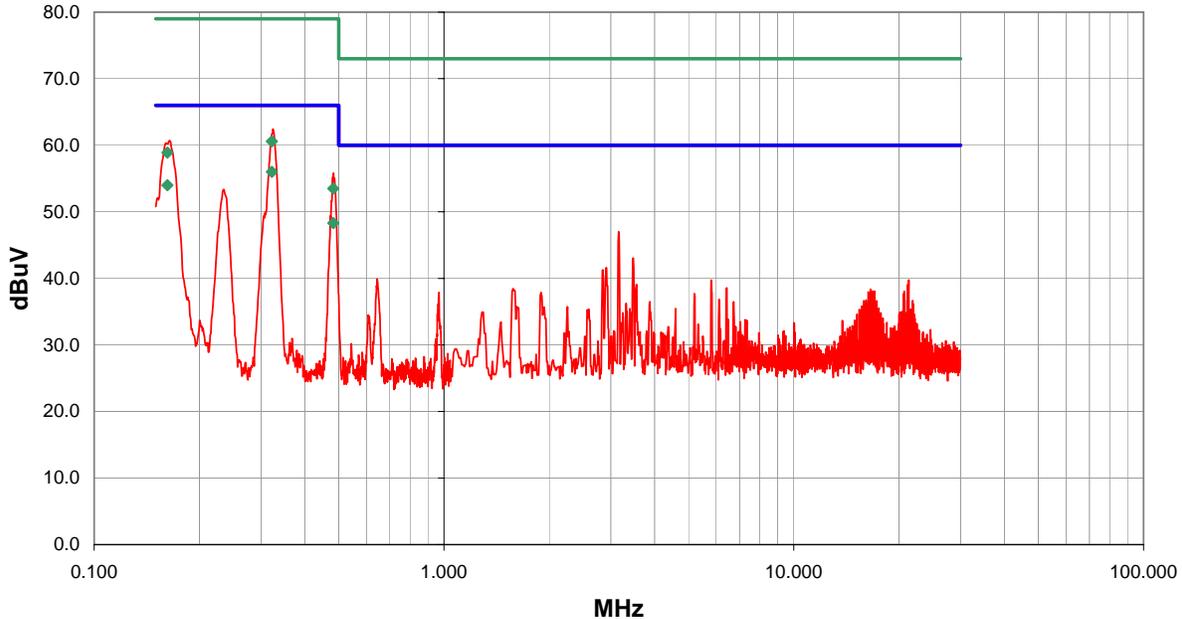
EUT OPERATING MODES
20 channels receiving

DEVIATIONS FROM TEST STANDARD
No deviations.

RESULTS	Line	Run #
Pass	Pos	4

Other

Holly Ashkannejhad
Tested By:



Freq (MHz)	Amplitude (dBuV)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Detector (blank equal peaks [PK] from scan)	Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.322	36.0	0.0	0.0	20.0	AV	56.0	66.0	-10.0
0.162	34.0	0.0	0.0	20.0	AV	54.0	66.0	-12.0
0.483	28.3	0.0	0.0	20.0	AV	48.3	66.0	-17.7
0.322	40.6	0.0	0.0	20.0	QP	60.6	79.0	-18.4
0.162	38.9	0.0	0.0	20.0	QP	58.9	79.0	-20.1
0.483	33.5	0.0	0.0	20.0	QP	53.5	79.0	-25.5
0.325	42.3	0.0	0.1	20.0		62.4	66.0	-3.6
0.164	40.6	0.0	0.1	20.0		60.7	66.0	-5.3
0.483	35.6	0.0	0.2	20.0		55.8	66.0	-10.2
0.235	33.2	0.0	0.2	20.0		53.4	66.0	-12.6
3.156	26.5	0.0	0.5	20.0		47.0	60.0	-13.0
3.476	22.5	0.0	0.5	20.0		43.0	60.0	-17.0
2.916	21.1	0.0	0.5	20.0		41.6	60.0	-18.4
2.846	20.8	0.0	0.5	20.0		41.3	60.0	-18.7
0.644	19.7	0.0	0.2	20.0		39.9	60.0	-20.1
21.332	18.4	0.0	1.4	20.0		39.8	60.0	-20.2
5.817	19.0	0.0	0.7	20.0		39.7	60.0	-20.3
3.556	18.5	0.0	0.6	20.0		39.1	60.0	-20.9
21.167	17.7	0.0	1.3	20.0		39.0	60.0	-21.0



Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. All of the EUT parameters listed below were investigated. This includes, but may not be limited to, CPU speeds, video resolution settings, operational modes, and input voltages.

Operating Modes Investigated:

Receive mode, 20 Channels configuration

Worst Case Operating Mode used for Final Test:

Receive mode, 20 Channels configuration (designated by client or system limitations)

Power Input Settings Investigated:

-48VDC

Worst Case Input Power Setting used for Final Test:

-48VDC (designated by client or system limitations)

Frequency Range Investigated

Start Frequency	Stop Frequency
30 MHz	5 GHz

Software\Firmware Applied During Test

Operating system	Version
VX Works	Unknown
Exercise software	Version
FCC Script	Unknown

Description

FCC script is a text file of commands run from a remote pc through ftp server that sets the radios to transmit. Without running the script, the unit automatically goes into receive mode.

EUT and Peripherals in Test Setup Boundary

Description	Manufacturer	Model/Part Number	Serial Number
iDEN Radio Base Station	Radio Frame Networks, Inc.	MC Series System	Engineering Production Unit #1
Subset of MC Series System	Radio Frame Networks, Inc.	PDU	Unknown
Subset of MC Series System	Radio Frame Networks, Inc.	RF Shelf	Unknown
Subset of MC Series System	Radio Frame Networks, Inc.	Radio Blade Shelf	Unknown
Subset of MC Series System	Radio Frame Networks, Inc.	Base Interface Chassis (BIC)	Unknown
Subset of MC Series System	Radio Frame Networks, Inc.	Airlink Interface Chassis (AIC)	Unknown

Remote Equipment Outside of Test Setup Boundary

Description	Manufacturer	Model/Part Number	Serial Number
Clock Source	Motorola	Unknown	Unknown

Equipment isolated from the EUT so as not to contribute to the measurement result is considered to be outside the test setup boundary.

Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Clock Source	Yes	5.0	No	Base Interface Chassis (BIC)	Clock Source
DC Power	No	6	No	PDU	DC Power

PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Antenna, Biconilog	EMCO	3141	AXE	12/03/2003	24 mo
Antenna, Horn	EMCO	3115	AHC	09/07/2004	12 mo
Pre-Amplifier	Amplifier Research	LN1000A	APS	02/05/2004	13 mo
Pre-Amplifier	Miteq	AMF-4D-005180-24-10P	APJ	01/05/2004	13 mo
Spectrum Analyzer	Hewlett-Packard	8566B	AAL	12/23/2003	13 mo
Quasi-Peak Adapter	Hewlett-Packard	85650A	AQF	12/23/2003	13 mo
Spectrum Analyzer Display	Hewlett Packard	85662A	AALD	12/23/2003	13 mo

Test Description

The final radiated emissions test was performed using the parameters described above as worst case. That final test was conducted at a facility that meets the ANSI C63.4 NSA requirements. The frequency range noted in the data sheets was scanned/tested at that facility. Emissions were maximized as specified, by maximizing table azimuth, antenna height, and cable manipulation.

Using the mode of operation and configuration noted within this report, a final radiated emissions test was performed. The frequency range investigated (scanned), is also noted in this report. Radiated emissions measurements were made at the EUT azimuth and antenna height such that the maximum radiated emissions level will be detected. This requires the use of a turntable and an antenna positioner. The preferred method of a continuous azimuth search is utilized for frequency scans of the EUT field strength with both polarities of the measuring antenna. A calibrated, linearly polarized antenna was positioned at the specified distance from the periphery of the EUT.

Note: The specified distance is the horizontal separation between the closest periphery of the EUT and the center of the axis of the elements of the receiving antenna. However, if the receiving antenna is a log-periodic array, the specified distance shall be the distance between the closest periphery of the EUT and the front-to-back center of the array of elements.

Tests were made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement was varied in height above the conducting ground plane to obtain the maximum signal strength. Though specified in the report, the measurement distance shall be 1 meter, 3 meters, 5 meters, 10 meters, or 30 meters. At any measurement distance, the antenna height was varied from 1 meter to 4 meters. These height scans apply for both horizontal and vertical polarization, except that for vertical polarization the minimum height of the center of the antenna shall be increased so that the lowest point of the bottom of the antenna clears the ground surface by at least 25 cm.

Measurement Bandwidths			
Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 – 0.15	1.0	0.2	0.2
0.15 – 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0
<i>Measurements were made using the bandwidths and detectors specified. No video filter was used.</i>			

Completed by:

EUT:	MC Series	Work Order:	RAFN0042
Serial Number:	Engineering Production Unit #1	Date:	10/19/04
Customer:	Radioframe Networks, Inc.	Temperature:	70
Attendees:	none	Humidity:	45%
Cust. Ref. No.:	N/A	Barometric Pressure:	29.61
Tested by:	Holly Ashkannejhad	Power:	-48VDC
		Job Site:	EV01

TEST SPECIFICATIONS

Specification:	FCC 15.109(b) Class A	Year:	2003
Method:	ANSI C63.4	Year:	2003

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

EUT OPERATING MODES

20 channels receiving

DEVIATIONS FROM TEST STANDARD

No deviations.

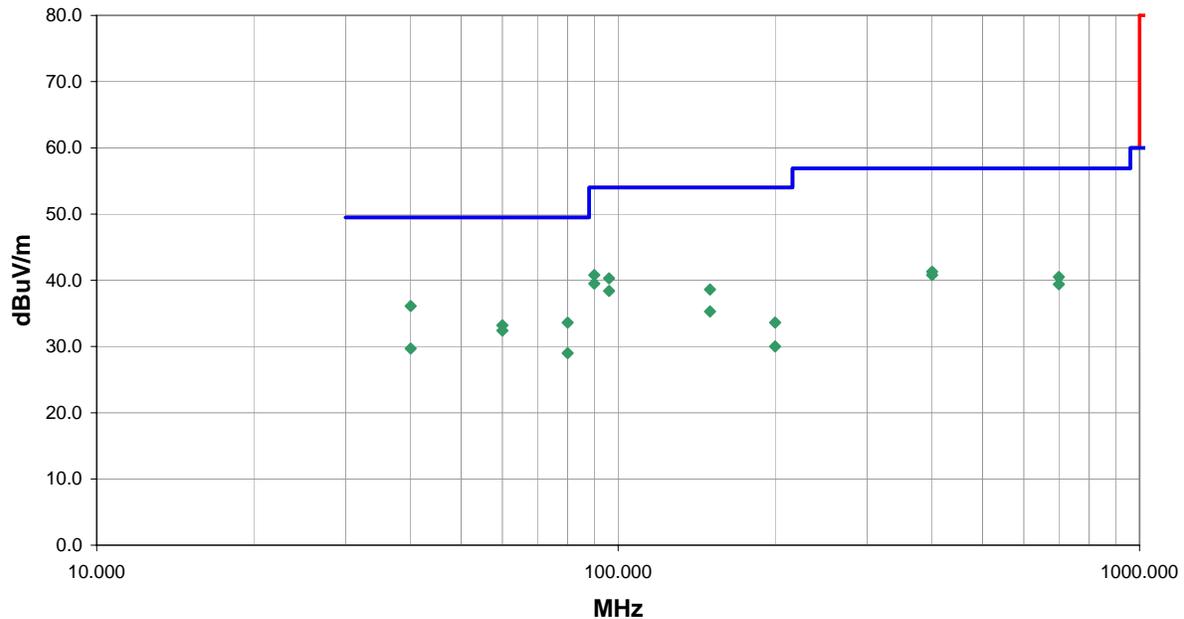
RESULTS

Pass	Run #	1
------	-------	---

Other

Holly Ashkannejhad

Tested By:



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
90.010	56.1	-15.3	179.0	1.0	3.0	0.0	V-Bilog	PK	0.0	40.8	54.0	-13.2
40.000	45.8	-9.7	146.0	1.0	3.0	0.0	V-Bilog	PK	0.0	36.1	49.5	-13.4
96.053	54.9	-14.6	172.0	1.0	3.0	0.0	V-Bilog	PK	0.0	40.3	54.0	-13.7
90.010	54.8	-15.3	186.0	1.5	3.0	0.0	H-Bilog	PK	0.0	39.5	54.0	-14.5
150.000	52.2	-13.6	148.0	1.0	3.0	0.0	V-Bilog	PK	0.0	38.6	54.0	-15.4
96.053	53.0	-14.6	199.0	2.2	3.0	0.0	H-Bilog	PK	0.0	38.4	54.0	-15.6
399.997	45.8	-4.5	328.0	1.0	3.0	0.0	H-Bilog	PK	0.0	41.3	56.9	-15.6
80.024	49.4	-15.8	188.0	1.2	3.0	0.0	V-Bilog	PK	0.0	33.6	49.5	-15.9
399.997	45.3	-4.5	326.0	1.6	3.0	0.0	V-Bilog	PK	0.0	40.8	56.9	-16.1
60.000	47.7	-14.5	166.0	3.0	3.0	0.0	H-Bilog	PK	0.0	33.2	49.5	-16.3
700.014	39.7	0.8	45.0	1.1	3.0	0.0	V-Bilog	PK	0.0	40.5	56.9	-16.4
60.000	46.9	-14.5	189.0	1.3	3.0	0.0	V-Bilog	PK	0.0	32.4	49.5	-17.1
700.014	38.6	0.8	215.0	1.4	3.0	0.0	H-Bilog	PK	0.0	39.4	56.9	-17.5
150.000	48.9	-13.6	309.0	1.5	3.0	0.0	H-Bilog	PK	0.0	35.3	54.0	-18.7
40.000	39.4	-9.7	135.0	2.2	3.0	0.0	H-Bilog	PK	0.0	29.7	49.5	-19.8
200.002	44.1	-10.5	156.0	1.0	3.0	0.0	V-Bilog	PK	0.0	33.6	54.0	-20.4
80.024	44.8	-15.8	60.0	2.2	3.0	0.0	H-Bilog	PK	0.0	29.0	49.5	-20.5
200.002	40.5	-10.5	162.0	2.2	3.0	0.0	H-Bilog	PK	0.0	30.0	54.0	-24.0





Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:

Mid

Operating Modes Investigated:

Typical

Data Rates Investigated:

Maximum

Output Power Setting(s) Investigated:

Maximum

Power Input Settings Investigated:

48 Vdc (nominal)

Software\Firmware Applied During Test

Exercise software	Standard Production Software	Version	N/A
Description			
The system was tested using standard operating production software to exercise the functions of the device during the testing.			

EUT and Peripherals

Description	Manufacturer	Model/Part Number	Serial Number
iDEN Radio Base Station	Radioframe Networks, Inc.	MC Series System	Engineering Production Unit
Power Supply	HP	6038A	LE44B

Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Leads	none	3.0	none	iDEN Radio Base Station	DC Supply
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Tektronix	2784	AAO	01/02/2005	12 mo
Multimeter	Fluke	79	MMC	12/02/2004	13 mo
Temperature Chamber	Thermotron	S8C	25-1756-06	09/16/2003	12 mo

Test Description

Requirement: Per 47 CFR 2.1055 and 90.217, the frequency stability shall be measured with variation of ambient temperature and primary supply voltage. A spectrum analyzer or frequency counter can be used to measure the frequency stability. If using a spectrum analyzer, it must have a precision frequency reference that exceeds the stability requirement of the transmitter. A temperature / humidity chamber is required.

Configuration:Variation of Supply Voltage

The primary supply voltage was varied from 85% to 115% of nominal. The EUT can only be operated from a 48 Vdc supply, so the DC input voltage was varied from 40.8 Vdc to 55.2 Vdc.

Variation of Ambient Temperature

Using a temperature chamber, the transmit frequency was recorded at the extremes of the specified temperature range (-30° to +50° C) and at 10°C intervals.

Measurements were made at mid frequency in the operational band. A direct connection was made between the RF output of the EUT and a spectrum analyzer. The spectrum analyzer is equipped with a precision frequency reference that exceeds the stability requirement of the EUT.

Completed by:

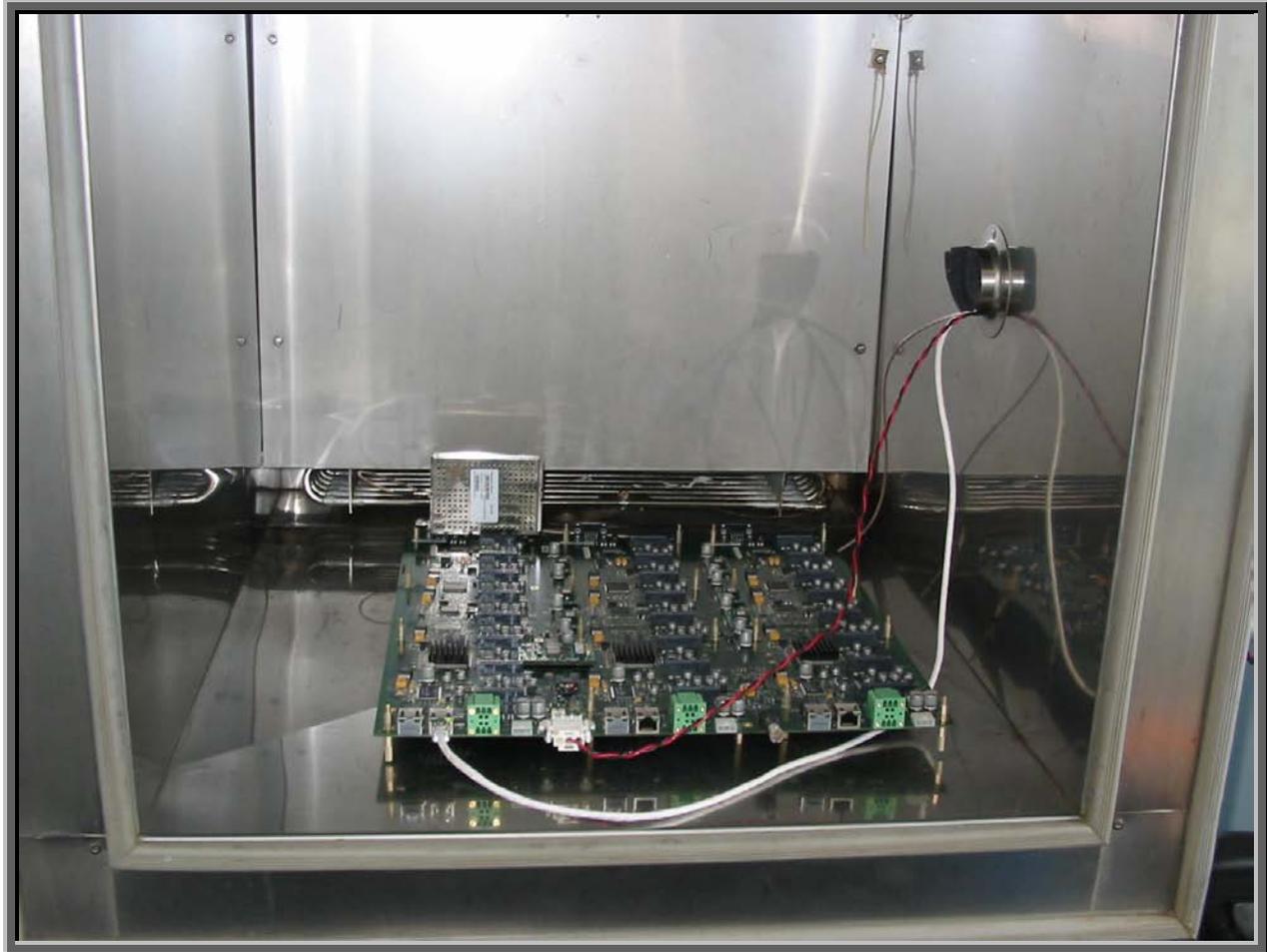
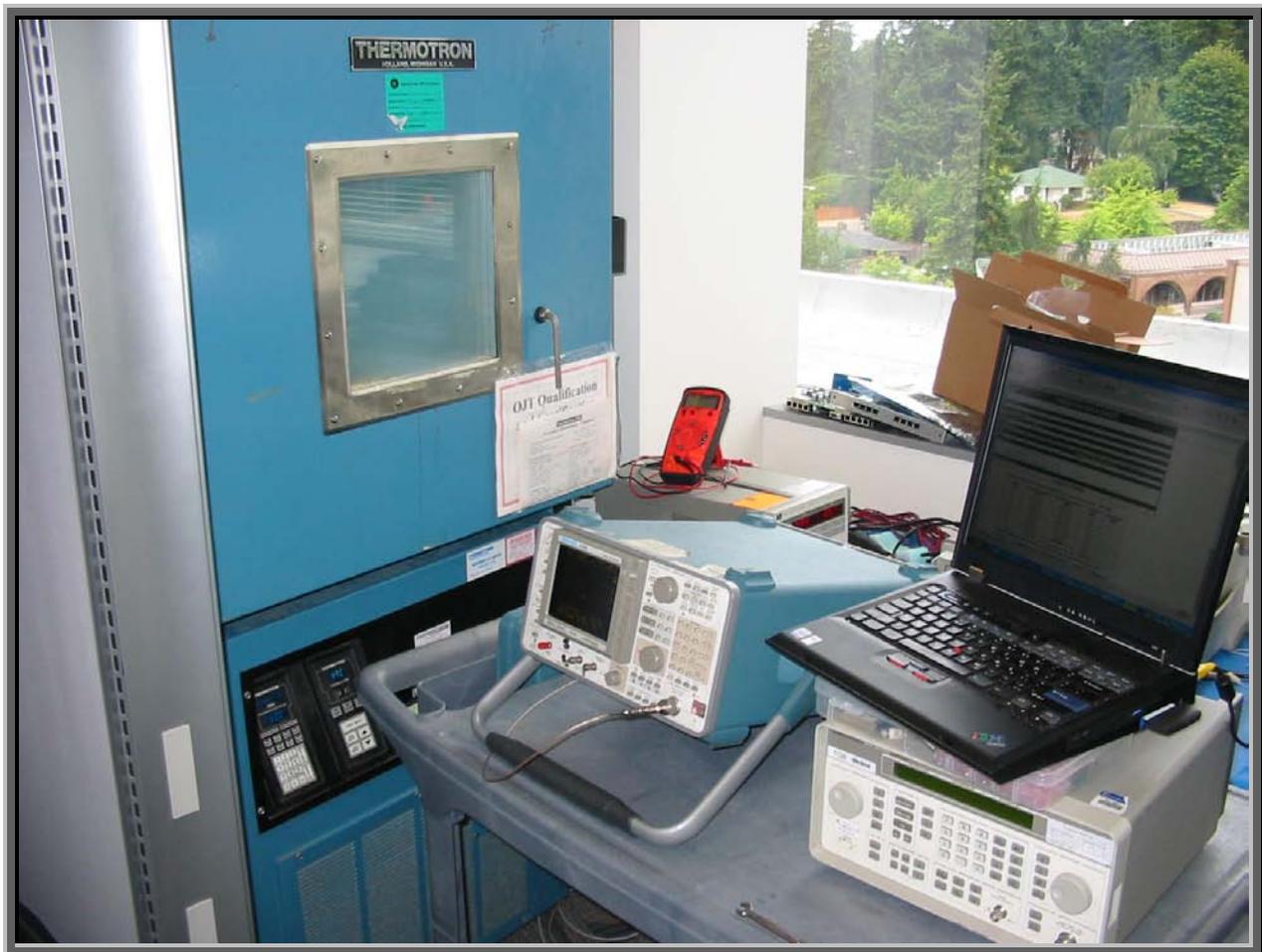
NORTHWEST EMC		EMISSIONS DATA SHEET		Rev BETA 01/30/01
EUT: MC Series System		Work Order: RAFN0040		
Serial Number: Engineering Production Unit #1		Date: 08/03/04		
Customer: Radioframe Networks, Inc.		Temperature: 73 F		
Attendees: Jeff Franck		Tested by: Greg Kiemel		Humidity: 41%
Customer Ref. No.: N/A		Power: 48 Vdc		Job Site: Off-site
TEST SPECIFICATIONS				
Specification: 47 CFR 2.1055, 90.217		Year: 2003	Method: TIA/EIA - 603	Year: 2001
SAMPLE CALCULATIONS				
COMMENTS				
EUT OPERATING MODES				
Transmitting mid band				
DEVIATIONS FROM TEST STANDARD				
None				
REQUIREMENTS				
Minimum frequency stability of 1 part per million (ppm) for variations of temperature and supply voltage (DC)				
RESULTS		MINIMUM FREQUENCY STABILITY		
Pass		0.08 ppm		
SIGNATURE				
 Tested By: _____				
DESCRIPTION OF TEST				
Frequency Stability				

Frequency Stability with Variation of Ambient Temperature (Primary Supply = 120V, 60Hz)

Temp (°C)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Tolerance (ppm)	Specification (ppm)
-30	865.61250	865.612500	0.00	1
-20	865.61250	865.612450	0.06	1
-10	865.61250	865.612465	0.04	1
0	865.61250	865.612460	0.05	1
10	865.61250	865.612440	0.07	1
20	865.61250	865.612435	0.08	1
30	865.61250	865.612455	0.05	1
40	865.61250	865.612475	0.03	1
50	865.61250	865.612455	0.05	1

Frequency Stability with Variation of Primary Supply Voltage (Ambient Temperature = 25°C)

Voltage (Vdc)	Assigned Frequency (MHz)	Measured Frequency (MHz)	Tolerance (ppm)	Specification (ppm)
55.2 (115%)	865.61250	865.612445	0.06	1
52.8 (110%)	865.61250	865.612445	0.06	1
50.4 (105%)	865.61250	865.612445	0.06	1
48 (100%)	865.61250	865.612445	0.06	1
45.6 (95%)	865.61250	865.612445	0.06	1
43.2 (90%)	865.61250	865.612445	0.06	1
40.8 (85%)	865.61250	865.612445	0.06	1



Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:

Low
Mid
High

Operating Modes Investigated:

Modulated Carrier

Data Rates Investigated:

Maximum

Output Power Setting(s) Investigated:

Maximum

Power Input Settings Investigated:

48 Vdc (nominal)

Software\Firmware Applied During Test

Exercise software	Standard Production Software	Version	N/A
Description			
The system was tested using standard operating production software to exercise the functions of the device during the testing.			

EUT and Peripherals

Description	Manufacturer	Model/Part Number	Serial Number
iDEN Radio Base Station	Radioframe Networks, Inc.	MC Series System	Engineering Production Unit
Power Supply	HP	6038A	LE44B

Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Leads	No	3.0	No	iDEN Radio Base Station	Power Supply

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Tektronix	2784	AAO	01/02/2005	12 mo
30 dB Dual Directional Coupler	Narda	3282B-30	0230	NCR	NA
50 ohm, 100W load	RES-NET	RFT100NFE	None	NCR	NA

Test Description

Requirement: Per 47 CFR 90.691, "The emission limits are as follows: (1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $116 \log_{10}(f/6.1)$ decibels or $50 + 10 \log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz. (2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz."

FCC Interpretation Regarding Emission Mask and 90.691

-----Original Message-----

From: Andrew Leimer [mailto:ALEIMER@fcc.gov] Sent: Wednesday, May 14, 2003 12:21 PM
 To: rwacs@att.net
 Subject: Re: Part 90 rules

Hello Dean,

How are you doing? I have not heard from you in a while! The following explanation is from the archives. The basic question was if emissions mask g would ever be used. I hope it answers your question:

I found that footnote 3 was added to Section 90.210 as a result of the First R&O, Eighth R&O and 2nd FNPRM in PR Docket 93-144 (FCC 95-501), adopted 12/15/95. Footnote 3 initially said "Equipment in this band licensed to EA systems shall comply with the emission mask provisions of Section 90.691." Note here that this R&O dealt principally with the upper 200 MHz SMR channels which were auctioned in contiguous segments/blocks. Consequently, providing more flexibility in the emission mask that required protection of the "outer" channels in those blocks and to any interior channels in those blocks used by incumbents made sense.

When the Commission subsequently dealt with auctioning the lower 80 channels (non-contiguous channels in each block) and the General Category channels (contiguously allocated channels by block for auction purposes but originally allocated on a single channel basis for site-specific licensing purposes), the consideration of emission mask caused footnote 3 to be modified as it exists today. Specifically, the Second R&O in PR Docket 93-144 (FCC 97-223), adopted

6/23/97 @ para 80 reasons that applying the same emission mask standards to the lower 230 channels (lower 80 channels and 150 General Category channels) as to the upper 200 channels facilitates the use of common equipment and the combining of all such channels. It further states that Section 90.691 (the emission mask) would apply to "outer" channels used by a licensee "that create out-of-band emissions that affect another licensee". The MO&O on reconsideration of the 800 MHz 1st R&O (FCC 97-224, adopted 6/23/97) at para 76 agreed with Ericsson's recommendation to expand the emission mask provision of Section 90.691 to "non-EA 800 MHz Part 90 CMRS systems". The decision was based ostensibly on extending the flexibility of the 90.691 emission mask to incumbent licensees (non-EA licensees or non-auction winners) and to those non-SMR channels used by CMRS operators. The paragraph closes by stating that neither Ericsson or Motorola believe that such relaxation will increase the amount of interference to adjacent channel licensees.

You'll note that there is some similarity between emission mask G (applicable to equipment without audio low pass filters) under Section 90.210 and the emission mask required by Section 90.691. It is my interpretation that footnote 3 under Section 90.210 (the applicability of the emission mask under Section 90.691) was intended principally for Part 90 CMRS systems in the 800 MHz band to provide flexibility and consistency to those operators. As Section 90.210 is written, however, I don't see how we could legally prevent any 800 MHz licensee from using the more flexible emission mask under Section 90.691.

Bottom line: As the rule is written, it is possible that the "G" mask would never be used by 800 MHz licensees.

>>> Dean Busch 05/14/03 01:22PM >>>
Andy;

I hope you can help me with this or at least point me in the right direction.

I have a client that has an EA based radio system that is currently using licensed transmitters with an output of 100mW in the 851 - 866 MHz range. The system is approved under 90.691. If the manufacturer raises the power level to 5 watts per channel output will they need to meet the emissions mask of 90.210 (g) or do they still fall under 90.691.

Thanks

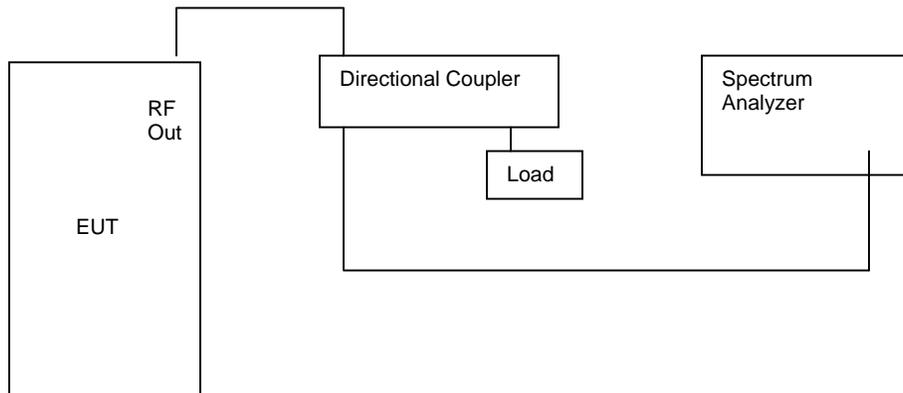
Dean Busch
Radiowave Compliance Services, Inc.

Configuration: The peak measurement was made using a directional coupler between the RF output of the EUT and a spectrum analyzer. The occupied bandwidth / emission mask was measured with the EUT set to low, medium, and high transmit frequencies. At each channel, measurements were made at the highest output settings. The output power is varied by changing the TX Attenuator setting on the EUT's amplifier to the following settings: High Power 11 db, Mid power 29 dB, and Low Power 49 dB.

See emission mask table below. It was concluded that testing at lower power levels was unnecessary since the general limit is -13 dBm. Clearly the high power configuration is worse case.

Channel	Output Power (dBm)	Power (P) Watts	In-band Attenuation (dBc)			Out Of Band (dBc)
			$50 + (10 \cdot \log P)$			
Low	20.49	1.12E-01	40.49	36.14	80	33.49
	0.14	1.03E-03	20.14	36.14	80	13.14
	-19.96	1.01E-05	0.04	36.14	80	-6.96
Mid	22.2	1.66E-01	42.2	36.14	80	35.2
	3.05	2.02E-03	23.05	36.14	80	16.05
	-18.3	1.48E-05	1.7	36.14	80	-5.3
High	20.65	1.16E-01	40.65	36.14	80	33.65
	0.85	1.22E-03	20.85	36.14	80	13.85
	-19.15	1.22E-05	0.85	36.14	80	-6.15

Test Setup Diagram



Completed by:



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 90.691	Year: Most Current	Method: TIA / EIA - 603	Year: Most Current

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES
Modulated by 16 QAM.

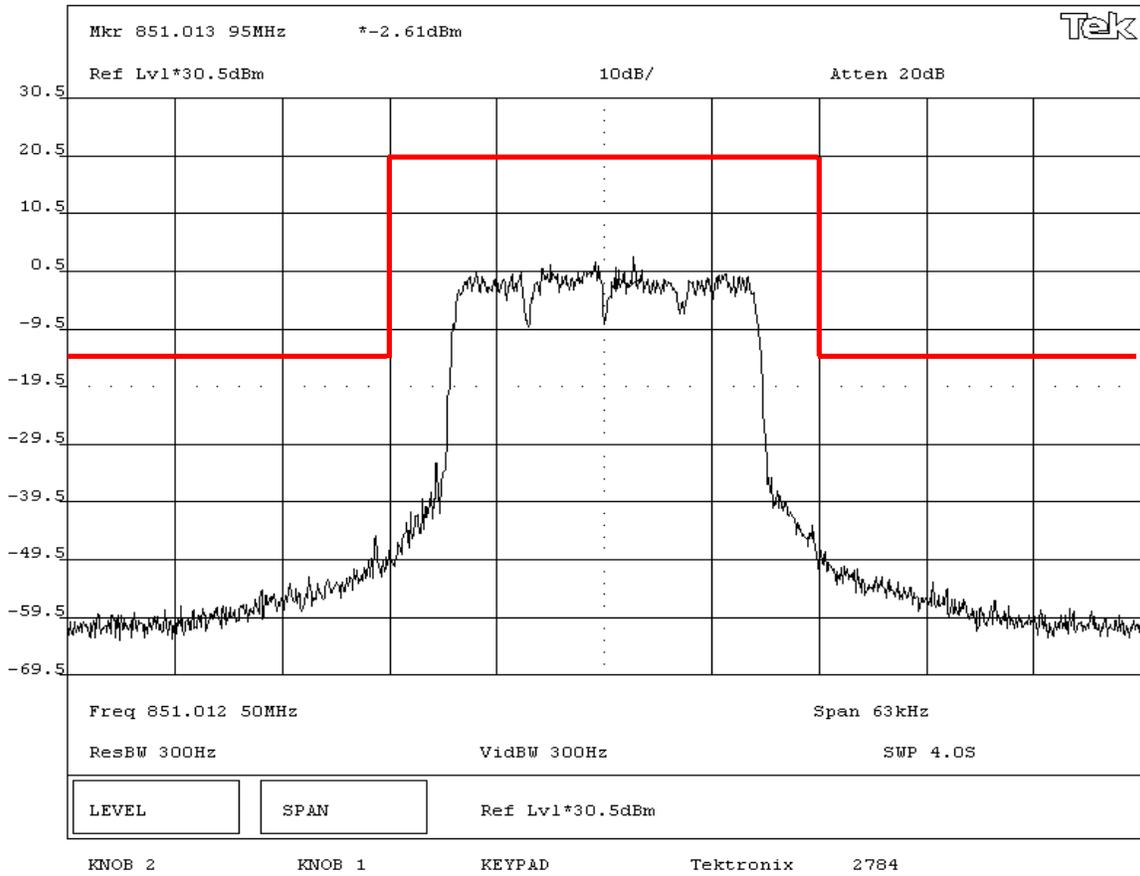
DEVIATIONS FROM TEST STANDARD
None

REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask. 0 dB reference is 20.49 dBm

RESULTS AMPLITUDE
Pass

SIGNATURE
Greg Kiemel
Tested By: _____

DESCRIPTION OF TEST
Emission Mask for EA-based Systems: Lowest Channel @ Highest Output Power



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 90.691	Year: Most Current	Method: TIA / EIA - 603	Year: Most Current

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES
Modulated by 16 QAM.

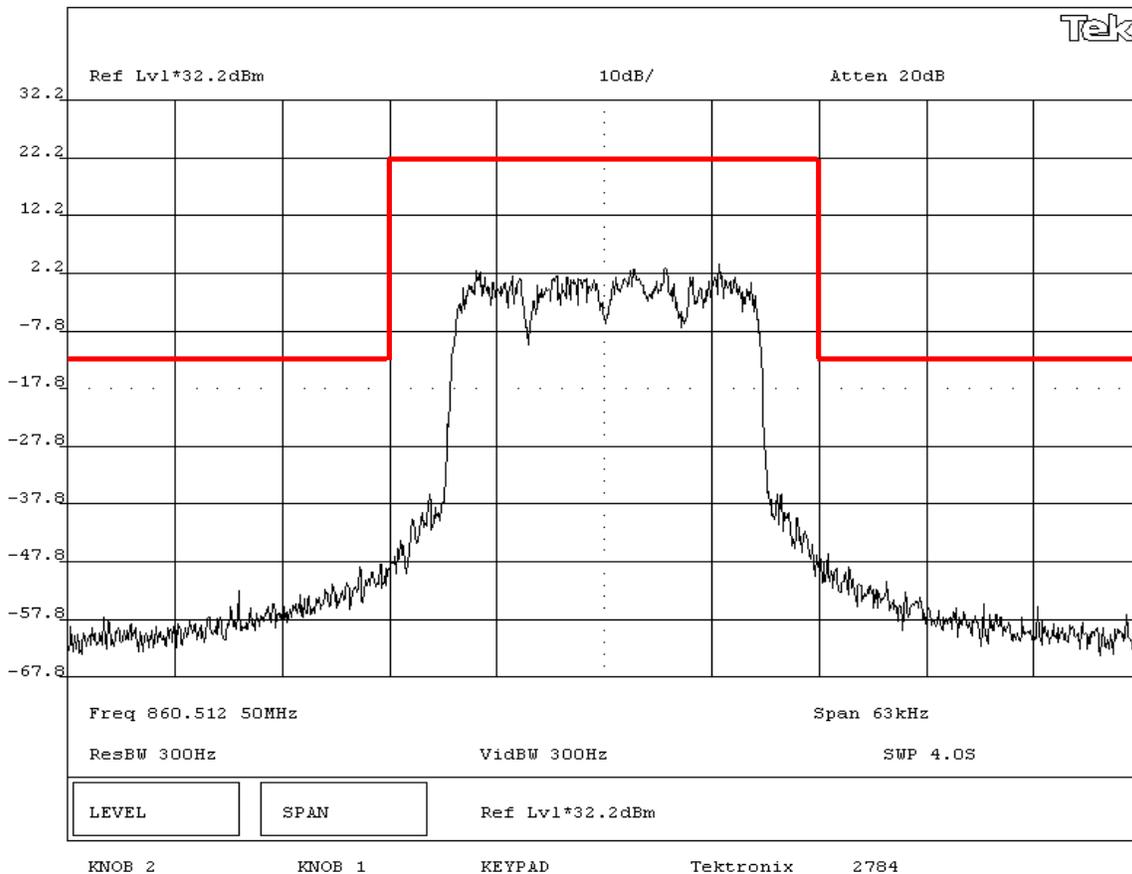
DEVIATIONS FROM TEST STANDARD
None

REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask. 0 dB reference is 22.20 dBm

RESULTS AMPLITUDE
Pass

SIGNATURE
Tested By: *Greg Kiemel*

DESCRIPTION OF TEST
Emission Mask for EA-based Systems: Middle Channel @ Highest Output Power



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 90.691	Year: Most Current	Method: TIA / EIA - 603	Year: Most Current

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES
Modulated by 16 QAM.

DEVIATIONS FROM TEST STANDARD
None

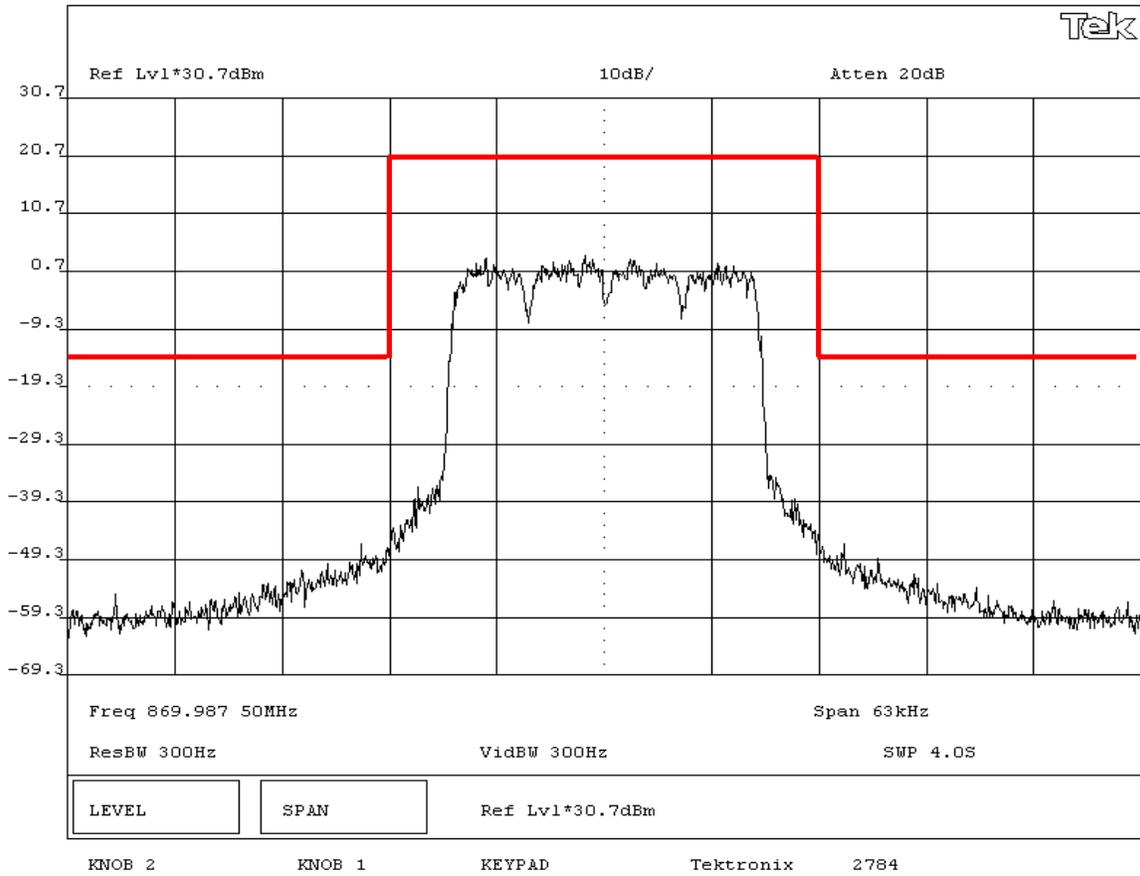
REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask. 0 dB reference is 20.65 dBm

RESULTS AMPLITUDE
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST
Emission Mask for EA-based Systems: Highest Channel @ Highest Output Power



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 90.691	Year: Most Current	Method: TIA / EIA - 603	Year: Most Current

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES
Modulated by 16 QAM.

DEVIATIONS FROM TEST STANDARD
None

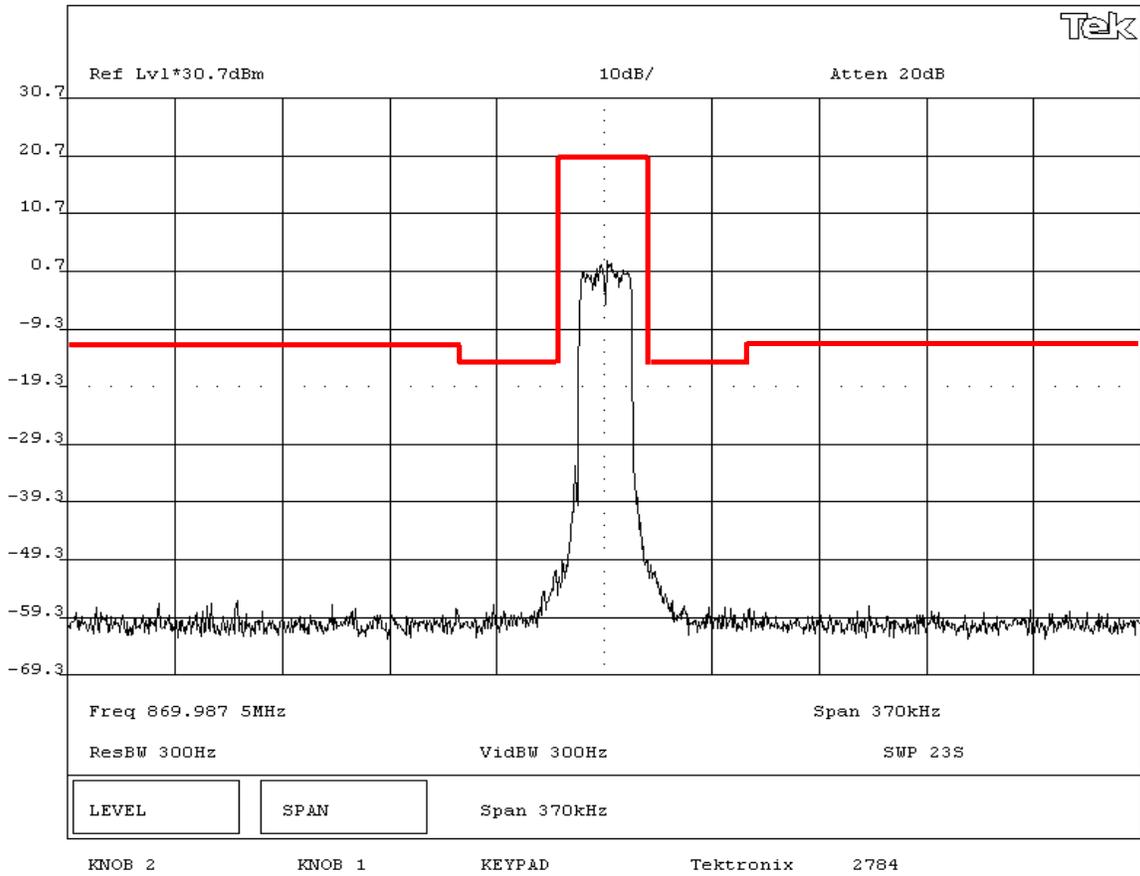
REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask. 0 dB reference is 20.65 dBm

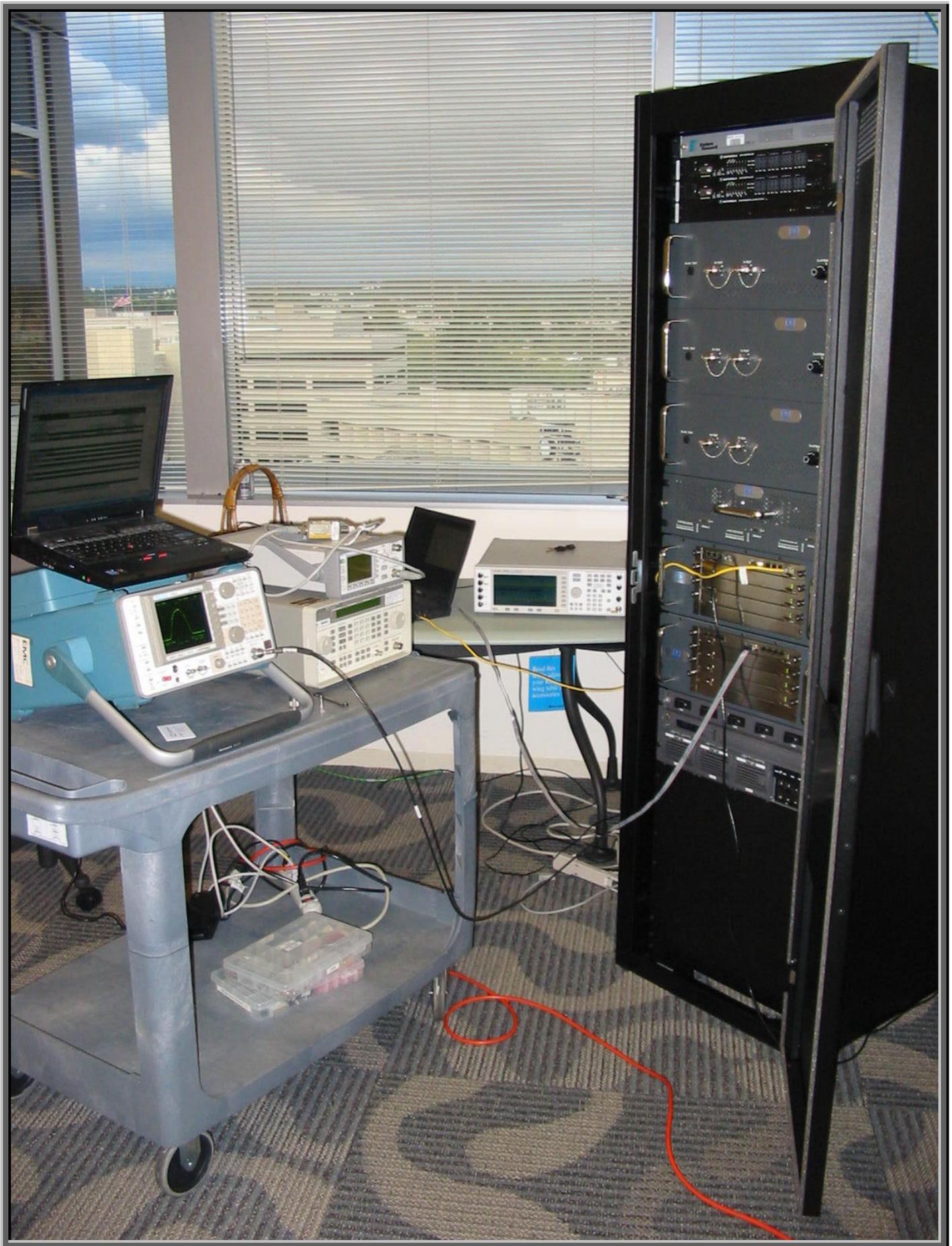
RESULTS AMPLITUDE

Pass

SIGNATURE
Tested By: *JK*

DESCRIPTION OF TEST
Emission Mask for EA-based Systems: Highest Channel @ Highest Output Power





Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:

Low
Mid
High

Operating Modes Investigated:

Modulated Carrier

Data Rates Investigated:

Maximum

Output Power Setting(s) Investigated:

Low
Mid
High

Power Input Settings Investigated:

48 Vdc (nominal)

Software\Firmware Applied During Test

Exercise software	Standard Production Software	Version	N/A
Description			
The system was tested using standard operating production software to exercise the functions of the device during the testing.			

EUT and Peripherals

Description	Manufacturer	Model/Part Number	Serial Number
iDEN Radio Base Station	Radioframe Networks, Inc.	MC Series System	Engineering Production Unit
Power Supply	HP	6038A	LE44B

Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Leads	none	3.0	none	iDEN Radio Base Station	Power Supply
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

Measurement Equipment					
Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Tektronix	2784	AAO	01/02/2005	12 mo
Power Meter	Hewlett Packard	E4418A	SPA	07/23/2004	24 mo
Power Sensor	Hewlett-Packard	8481H	SPB	07/23/2004	24 mo
Signal Generator	Hewlett-Packard	8648A	TGB	03/16/2004	13 mo
30 dB Dual Directional Coupler	Narda	3282B-30	0230	NCR	NA
50 ohm, 100W load	RES-NET	RFT100NFE	None	NCR	NA

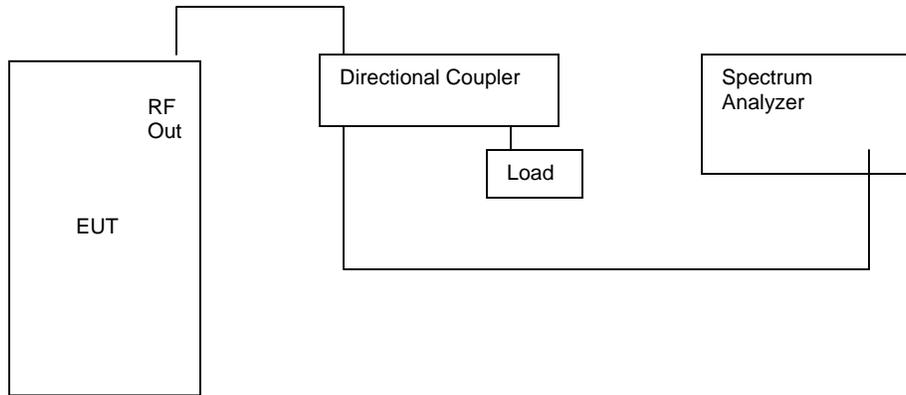
Test Description

Requirement: Per 47 CFR 2.1046 and 90.217, the conducted power output was measured at the RF output terminals after the tune-up procedure.

Configuration: The peak measurement was made using a directional coupler between the RF output of the EUT and a spectrum analyzer. Prior to making the measurement, the test setup (including directional coupler, RF load, spectrum analyzer and coaxial cable) was calibrated using a the power meter and signal source.

The peak output power was measured with the EUT set to low, medium, and high transmit frequencies. The lowest output power, the middle output power, and the highest output power was measured at each channel. The output power was varied by changing the TX Attenuator setting on the EUT's amplifier to the following settings: High Power 11 db, Mid power 29 dB, and Low Power 49 dB. Did not test total power in the band with all 20 blades transmitting or with 8 blades per sector. Rather, it was confirmed that the output power per channel is level across the band (+/- 1.5 dB). Therefore, for MPE estimates, a simple summation of the power in each channel will be sufficient.

Test Setup Diagram



Completed by:

A. J. U. K. P.

NORTHWEST EMC EMISSIONS DATA SHEET Rev BETA 01/30/01

EUT: MC Series System		Work Order: RAFN0040
Serial Number: Engineering Production Unit #1		Date: 08/03/04
Customer: Radioframe Networks, Inc.		Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel	Humidity: 41%
Customer Ref. No.: N/A	Power: -48 Vdc	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1046 & 90.217	Year: Most Current	Method: TIA/EIA-603	Year: Most Current

SAMPLE CALCULATIONS

COMMENTS

Tested in System configuration

EUT OPERATING MODES

With modulation

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

RESULTS **AMPLITUDE**

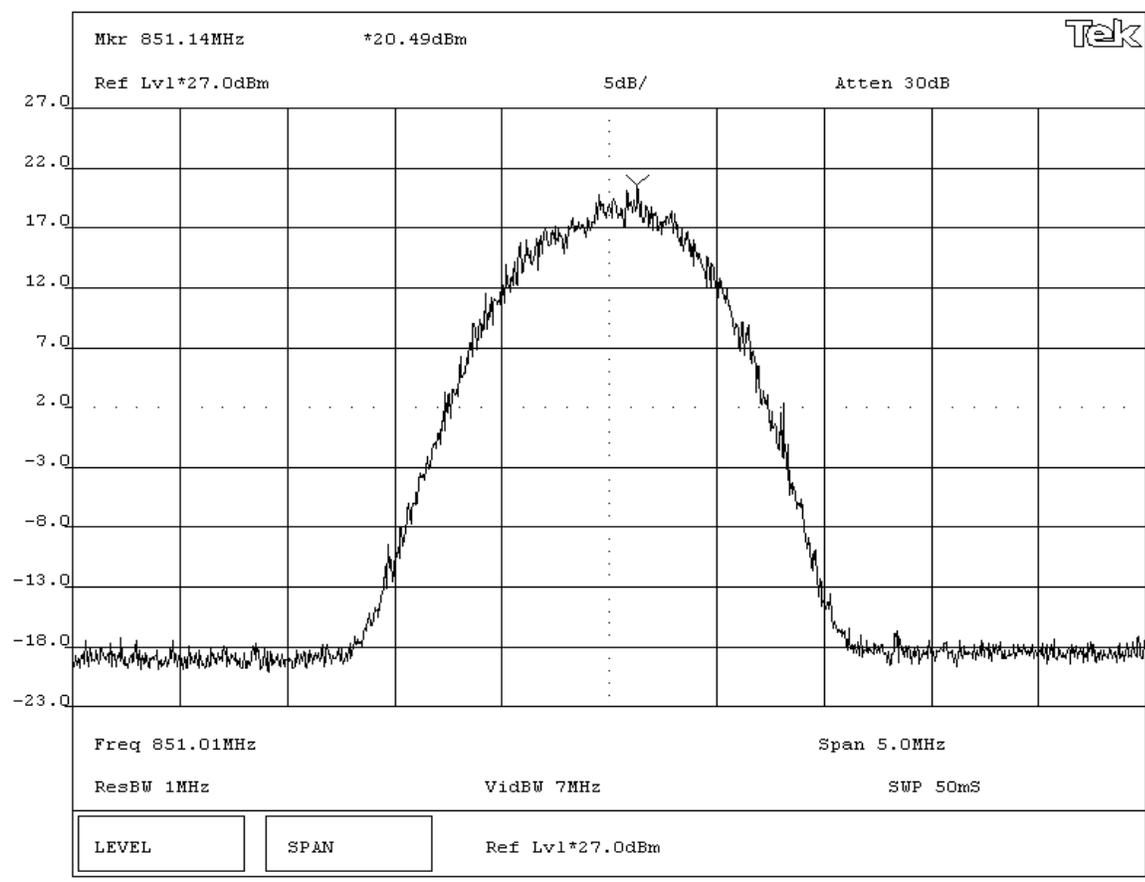
Pass 20.49 dBm

SIGNATURE

Tested By: *Greg Kiemel*

DESCRIPTION OF TEST

Output Power - Low Channel, High Power



EMISSIONS DATA SHEET

EUT: MC Series System		Work Order: RAFN0040
Serial Number: Engineering Production Unit #1		Date: 08/03/04
Customer: Radioframe Networks, Inc.		Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel	Humidity: 41%
Customer Ref. No.: N/A	Power: -48 Vdc	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1046 & 90.217	Year: Most Current	Method: TIA/EIA-603	Year: Most Current

SAMPLE CALCULATIONS			

COMMENTS

Tested in System configuration

EUT OPERATING MODES

With modulation

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

RESULTS

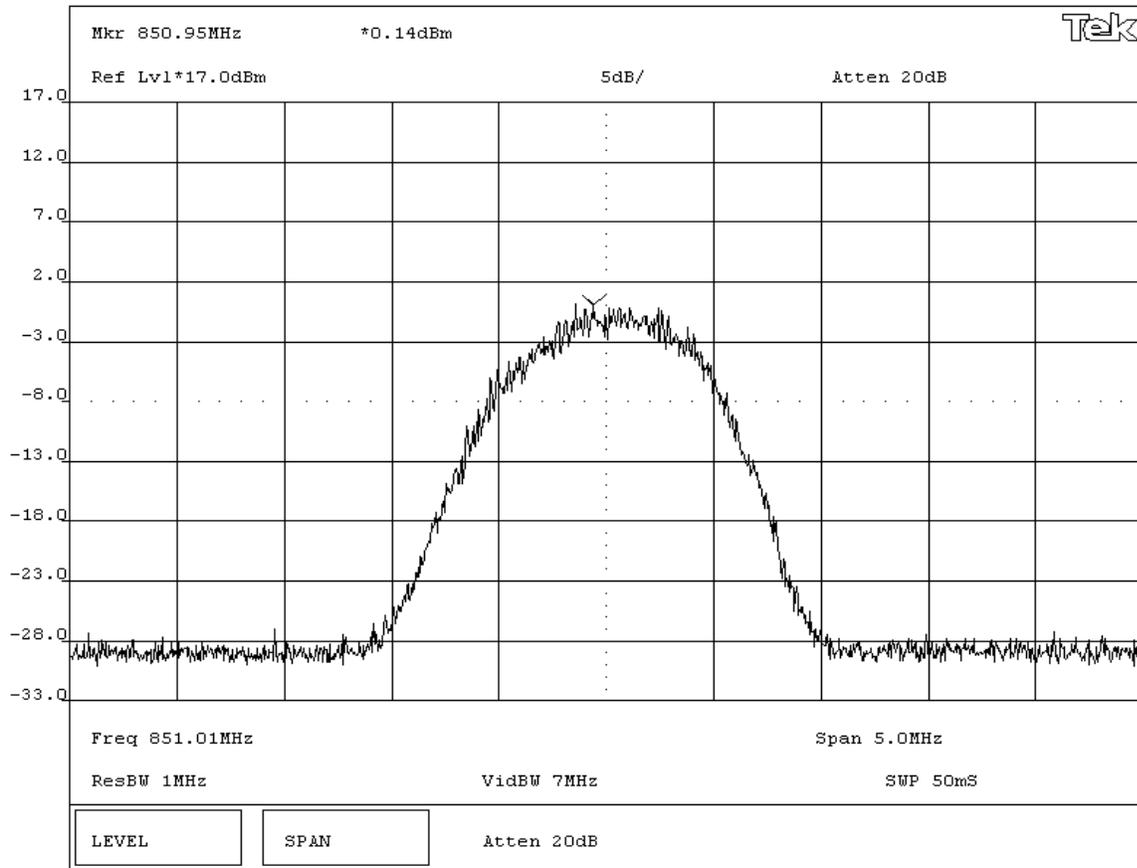
Pass AMPLITUDE
0.14 dBm

SIGNATURE

Tested By: *Greg Kiemel*

DESCRIPTION OF TEST

Output Power - Low Channel, Medium Power



EUT: MC Series System		Work Order: RAFN0040
Serial Number: Engineering Production Unit #1		Date: 08/03/04
Customer: Radioframe Networks, Inc.		Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel	Humidity: 41%
Customer Ref. No.: N/A	Power: -48 Vdc	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1046 & 90.217	Year: Most Current	Method: TIA/EIA-603	Year: Most Current

SAMPLE CALCULATIONS	

COMMENTS
Tested in System configuration

EUT OPERATING MODES
With modulation

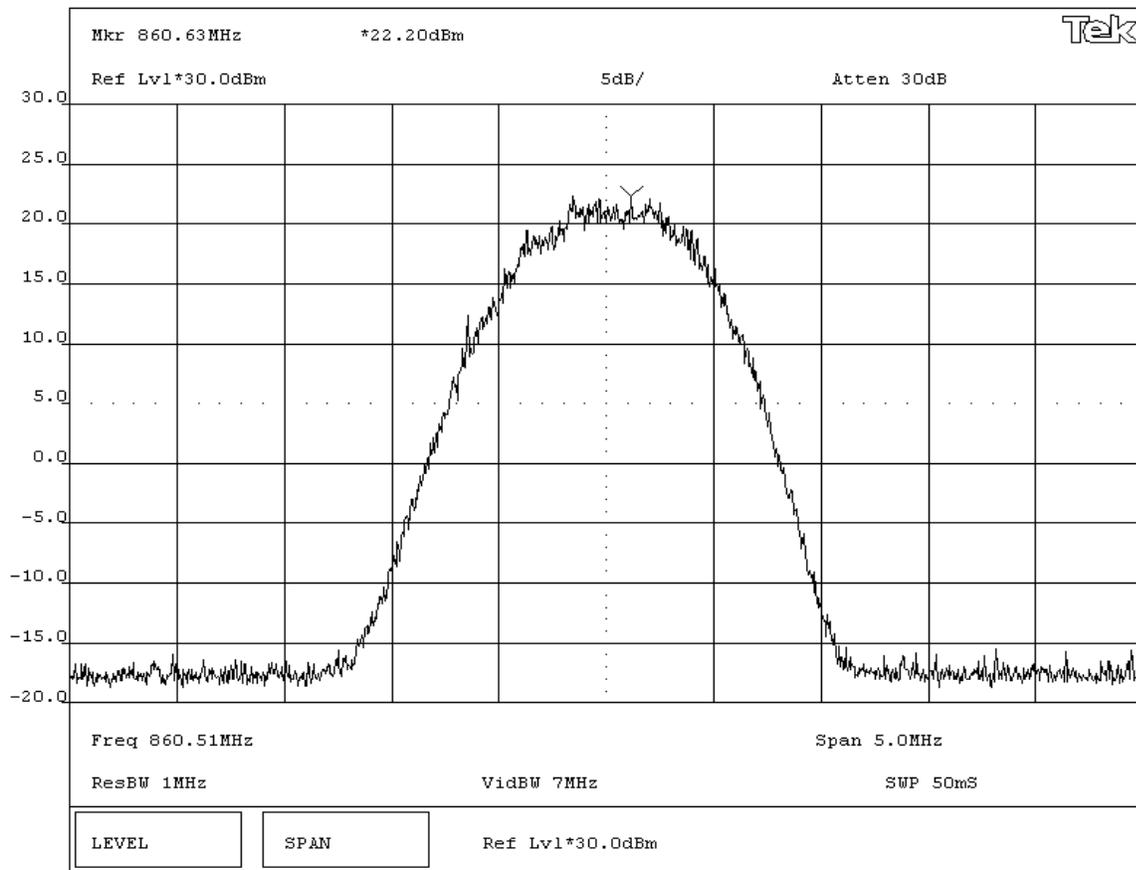
DEVIATIONS FROM TEST STANDARD
None

REQUIREMENTS

RESULTS	AMPLITUDE
Pass	22.20 dBm

SIGNATURE
Tested By: *Greg Kiemel*

DESCRIPTION OF TEST
Output Power - Medium Channel, High Power



EMISSIONS DATA SHEET

EUT: MC Series System		Work Order: RAFN0040
Serial Number: Engineering Production Unit #1		Date: 08/03/04
Customer: Radioframe Networks, Inc.		Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel	Humidity: 41%
Customer Ref. No.: N/A	Power: -48 Vdc	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1046 & 90.217	Year: Most Current	Method: TIA/EIA-603	Year: Most Current

SAMPLE CALCULATIONS	

COMMENTS

Tested in System configuration

EUT OPERATING MODES

With modulation

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

RESULTS	AMPLITUDE
---------	-----------

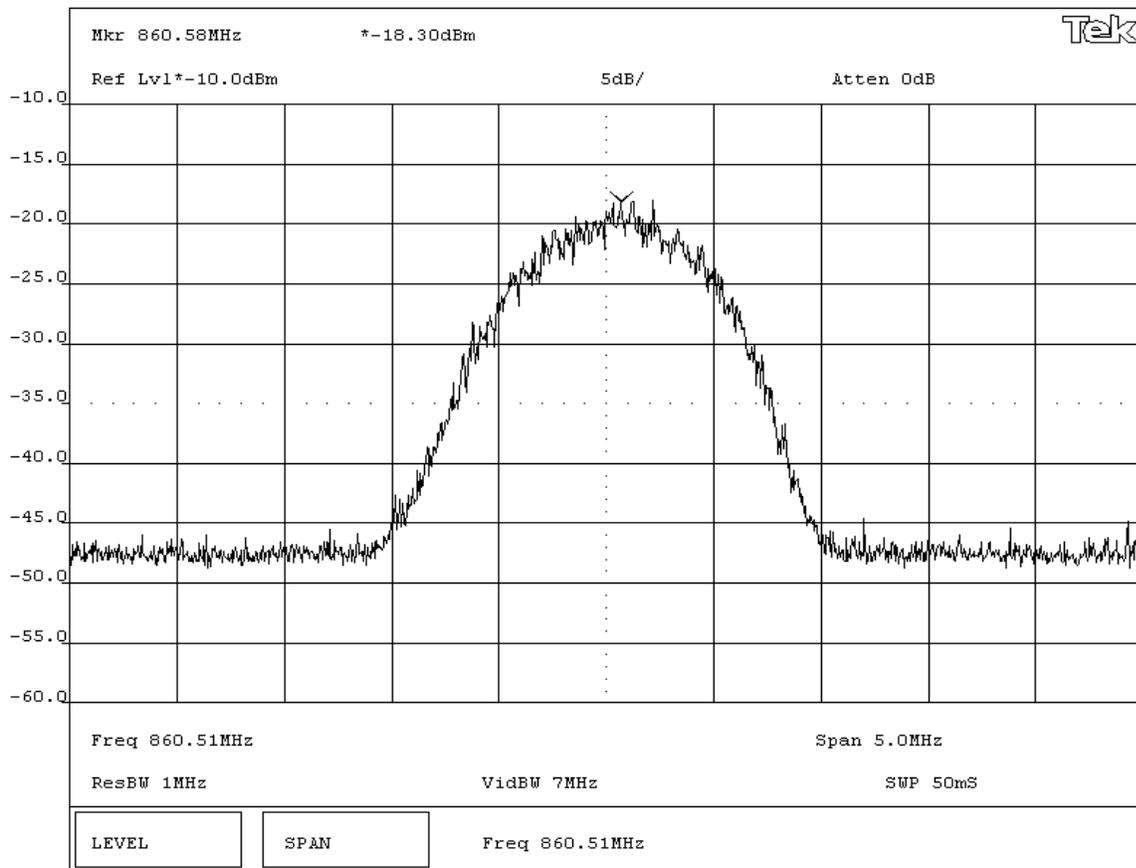
Pass -18.30 dBm

SIGNATURE

Tested By: *Greg Kiemel*

DESCRIPTION OF TEST

Output Power - Medium Channel, Low Power



EMISSIONS DATA SHEET

EUT: MC Series System		Work Order: RAFN0040
Serial Number: Engineering Production Unit #1		Date: 08/03/04
Customer: Radioframe Networks, Inc.		Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel	Humidity: 41%
Customer Ref. No.: N/A	Power: -48 Vdc	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1046 & 90.217	Year: Most Current	Method: TIA/EIA-603	Year: Most Current

SAMPLE CALCULATIONS	

COMMENTS

Tested in System configuration

EUT OPERATING MODES

With modulation

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

RESULTS	AMPLITUDE
---------	-----------

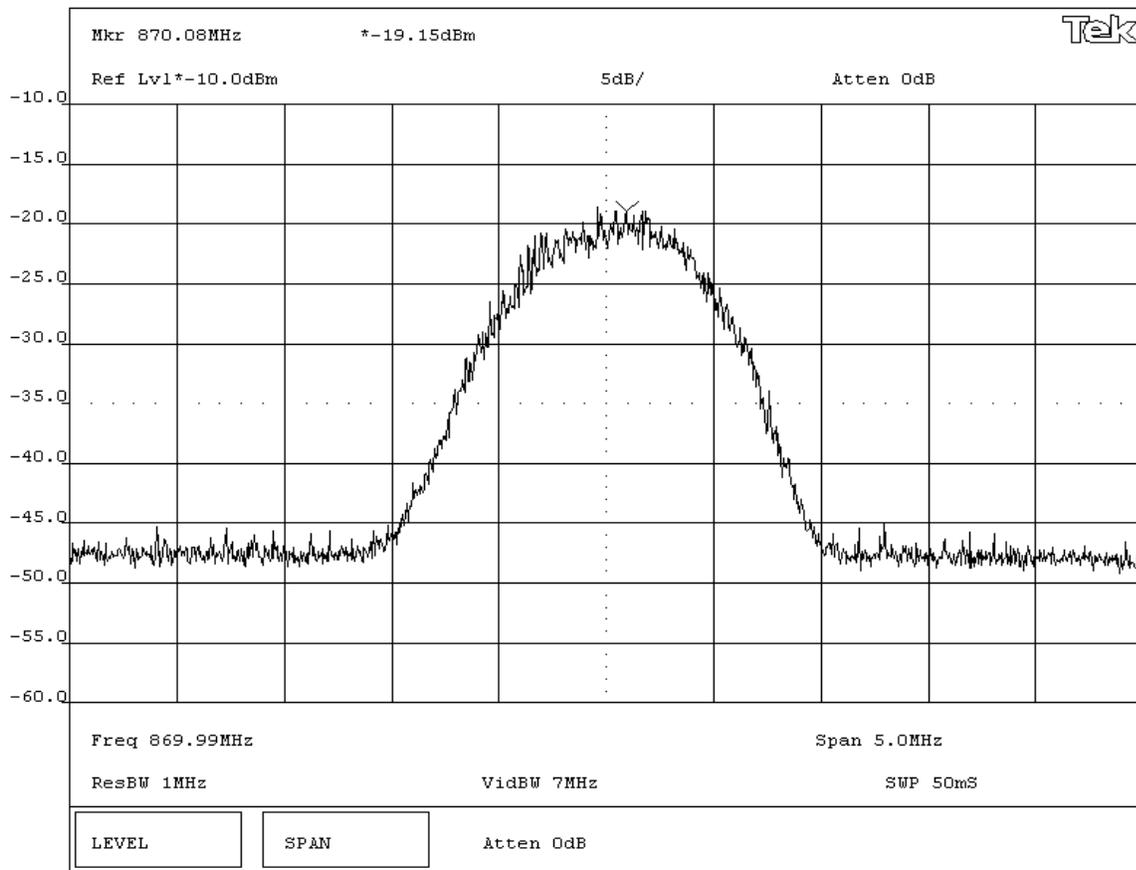
Pass -19.15 dBm

SIGNATURE

Tested By: 

DESCRIPTION OF TEST

Output Power - High Channel, Low Power





Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:

Low
Mid
High
3 Signal
8 Signal
20 Signal

Operating Modes Investigated:

Modulated Carrier

Data Rates Investigated:

Maximum

Output Power Setting(s) Investigated:

Lowest
Middle
Maximum

Power Input Settings Investigated:

48 Vdc (nominal)

Frequency Range Investigated

Start Frequency	0 MHz	Stop Frequency	9 GHz
------------------------	-------	-----------------------	-------

Software\Firmware Applied During Test

Exercise software	Standard Production Software	Version	N/A
Description			
The system was tested using standard operating production software to exercise the functions of the device during the testing.			

EUT and Peripherals

Description	Manufacturer	Model/Part Number	Serial Number
iDEN Radio Base Station	Radioframe Networks, Inc.	MC Series System	Engineering Production Unit #1
Power Supply	HP	6038A	LE44B

Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Leads	No	3.0	No	iDEN Radio Base Station	Power Supply

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Tektronix	2784	AAO	01/02/2005	12 mo
30 dB Dual Directional Coupler	Narda	3282B-30	0230	NCR	NA
50 ohm, 100W load	RES-NET	RFT100NFE	None	NCR	NA

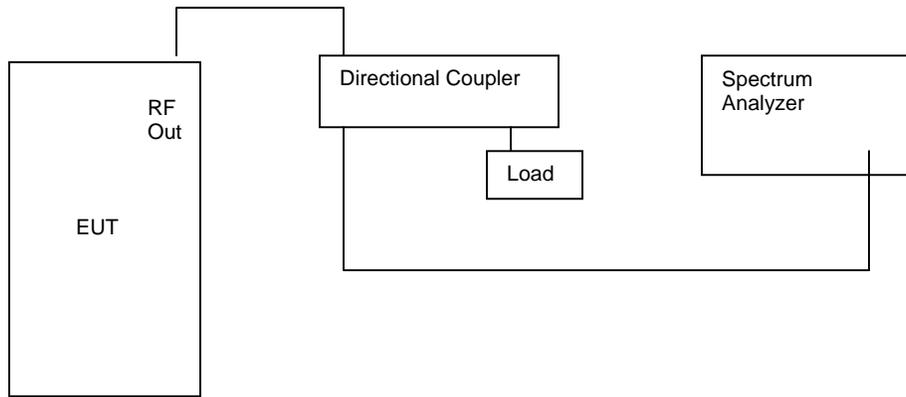
Test Description

Requirement: Per 47 CFR 90.691, "any emission appearing on a frequency 25 kHz or more removed from the assigned frequency must be attenuated at least 30 dB below the un-modulated carrier. For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $43 + 10\log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz." Per 47 CFR 2.1051, the spurious emissions were measured at the RF output terminals with analyzer plots made for each modulation type.

Configuration: The peak measurement was made using a directional coupler between the RF output of the EUT and a spectrum analyzer. The spurious conducted emissions were measured with the EUT set to low, medium, and high transmit frequencies. At each channel, measurements were made for the lowest output power, the middle output power, and the highest output settings. The output power was varied by changing the TX Attenuator setting on the EUT's amplifier to the following settings: High Power 11 db, Mid power 29 dB, and Low Power 49 dB.

The FCC's three tone test for intermodulations products was also performed. Per Publication number 670583 from the FCC's Knowledge Database (<http://gulfoss2.fcc.gov/prod/oet/cf/kdb/>), the IM test(s) is done with three signals of equal magnitude - at their highest rated output level - for each type of modulation. The signals are spaced so that two are near to each other at one edge of the pass band and the other signal is alone at the other edge of the pass band. This placement will potentially produce both in-band and out-of-band IM products. The three signal test was performed in exactly this way. At the maximum output power, both in-band and out-of-band measurements were made. The IM test was then repeated with 8 signals, and then again with 20 signals.

Test Setup Diagram



Completed by:

U.K.P.

NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/20/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at medium output power level (approx. 0 dBm)

DEVIATIONS FROM TEST STANDARD
None

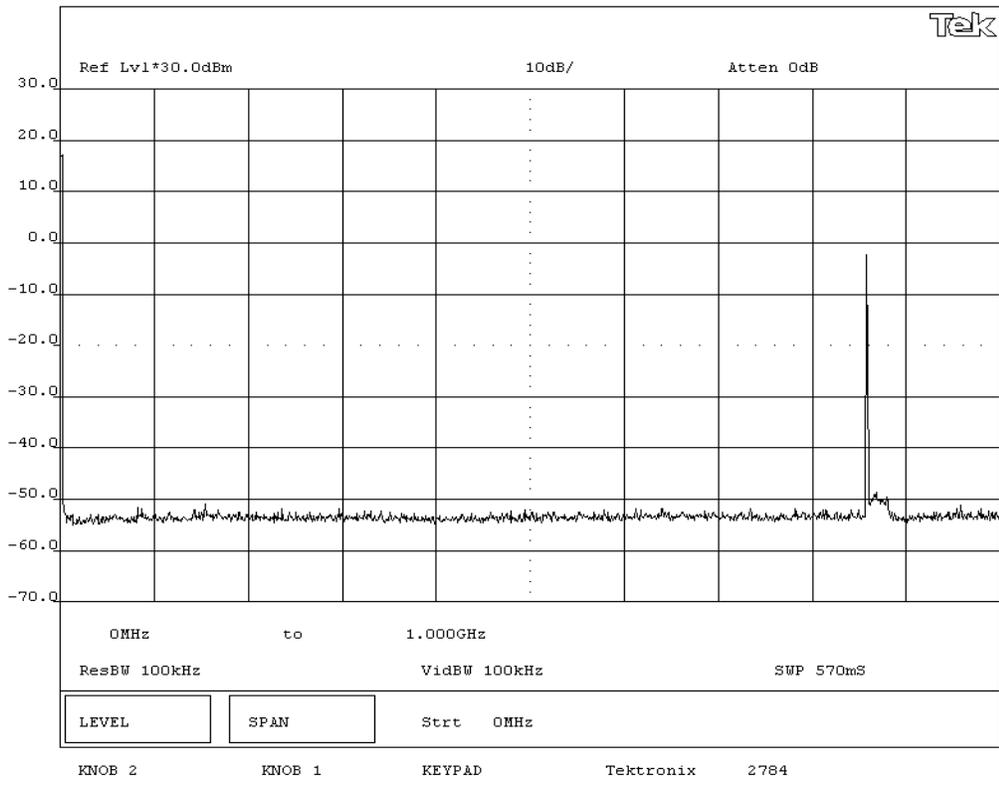
REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - Low Channel 0MHz-1GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/20/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

COMMENTS

Tested in System Configuration

EUT OPERATING MODES

With modulation at medium output power level (approx. 0 dBm)

DEVIATIONS FROM TEST STANDARD

None

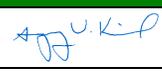
REQUIREMENTS

Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS

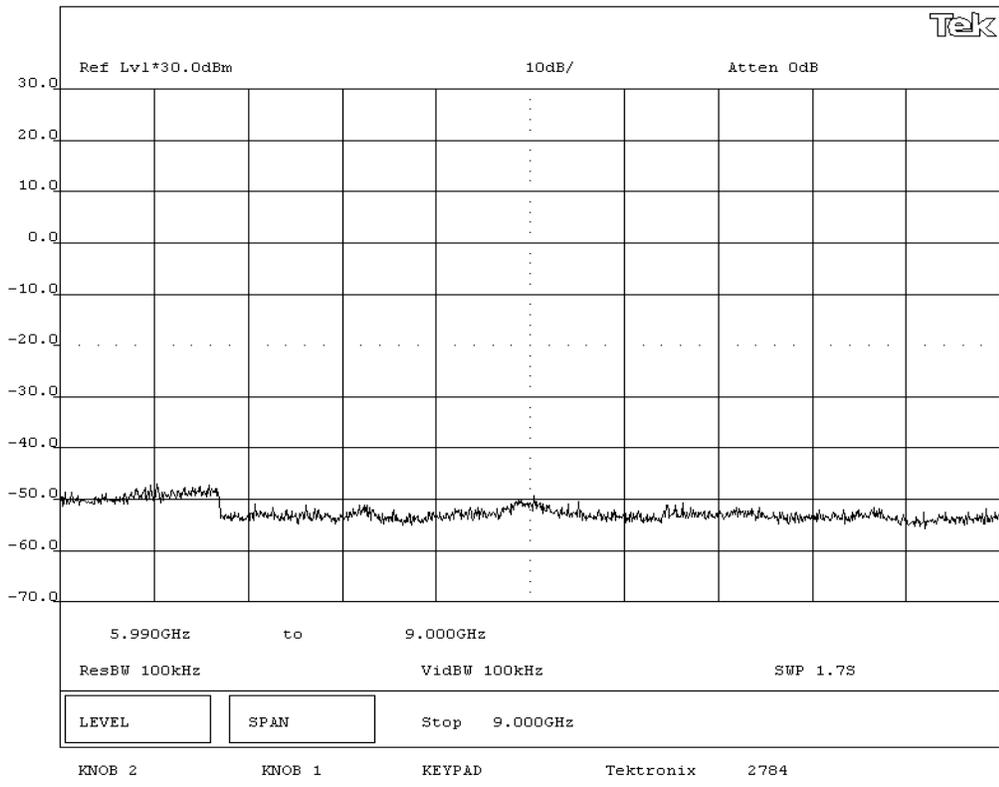
Pass

SIGNATURE

Tested By: 

DESCRIPTION OF TEST

Antenna Conducted Spurious Emissions - Low Channel 6GHz - 9GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/20/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at medium output power level (approx. 0 dBm)

DEVIATIONS FROM TEST STANDARD
None

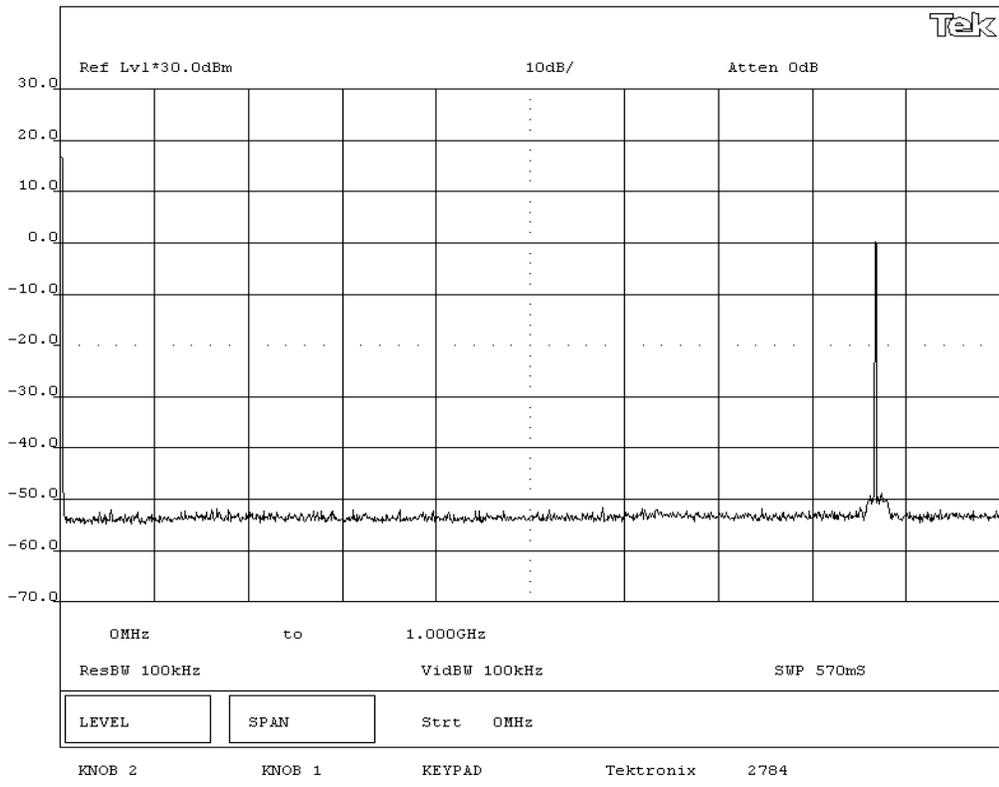
REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - Mid Channel 0MHz-1GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/20/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at medium output power level (approx. 0 dBm)

DEVIATIONS FROM TEST STANDARD
None

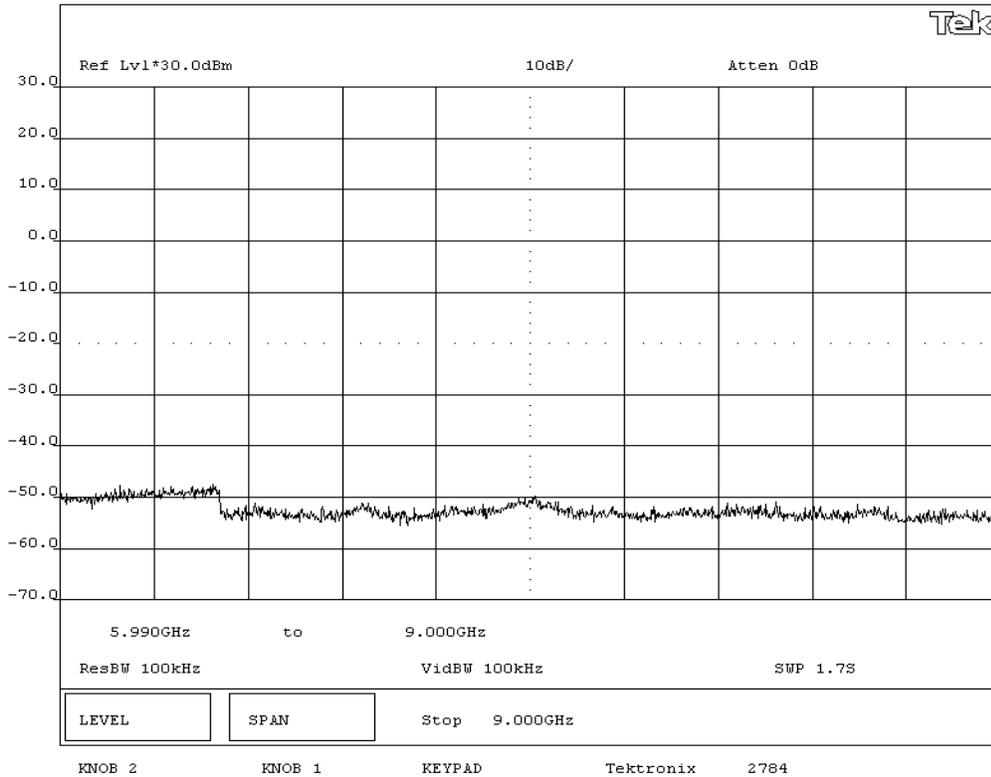
REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - Mid Channel 6GHz-9GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/20/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at medium output power level (approx. 0 dBm)

DEVIATIONS FROM TEST STANDARD
None

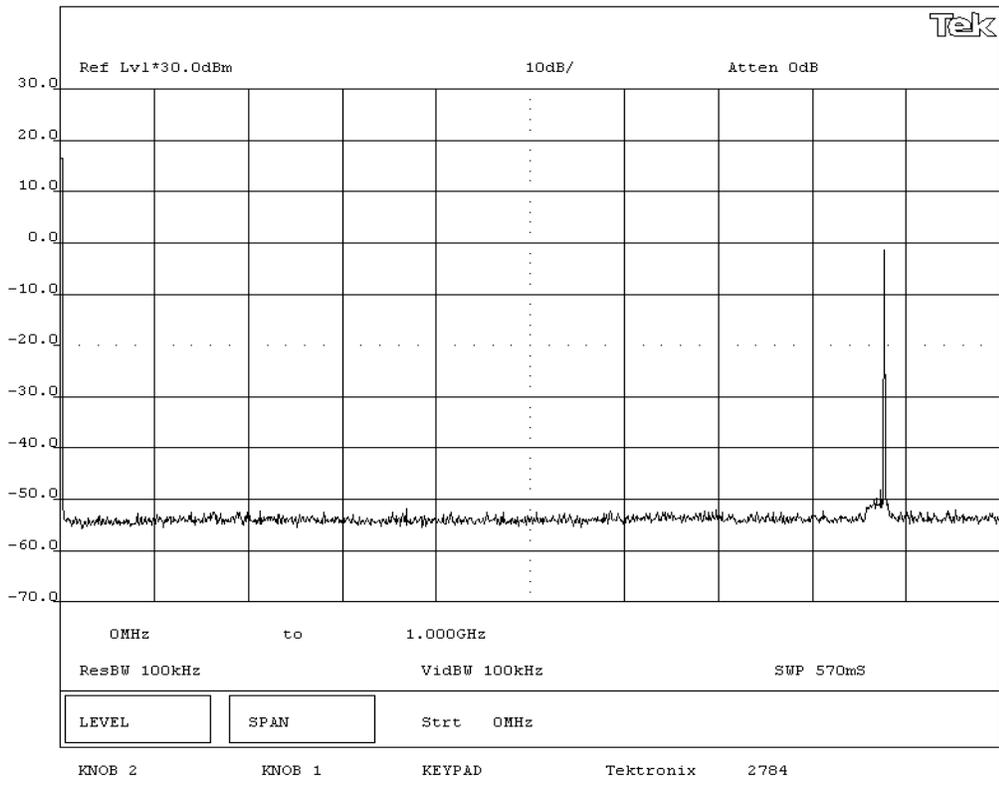
REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE

Tested By: *Greg Kiemel*

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - High Channel 0MHz-1GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/20/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

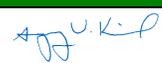
COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at medium output power level (approx. 0 dBm)

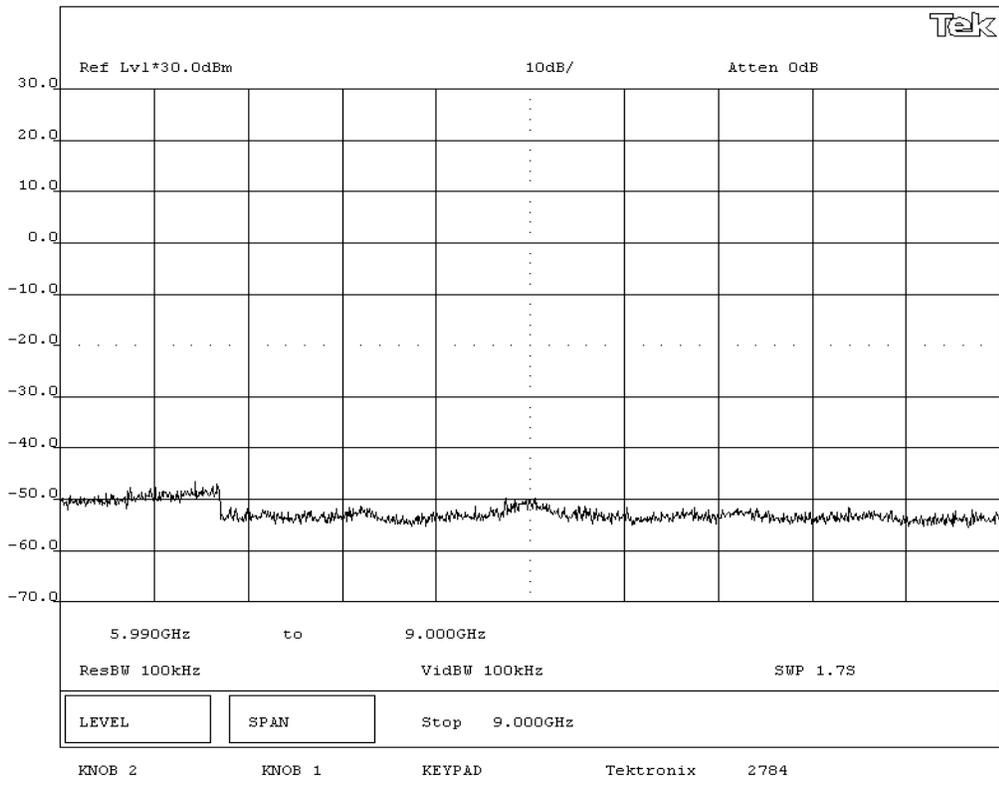
DEVIATIONS FROM TEST STANDARD
None

REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - High Channel 6GHz-9GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/20/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at low output power level (approx. -20 dBm)

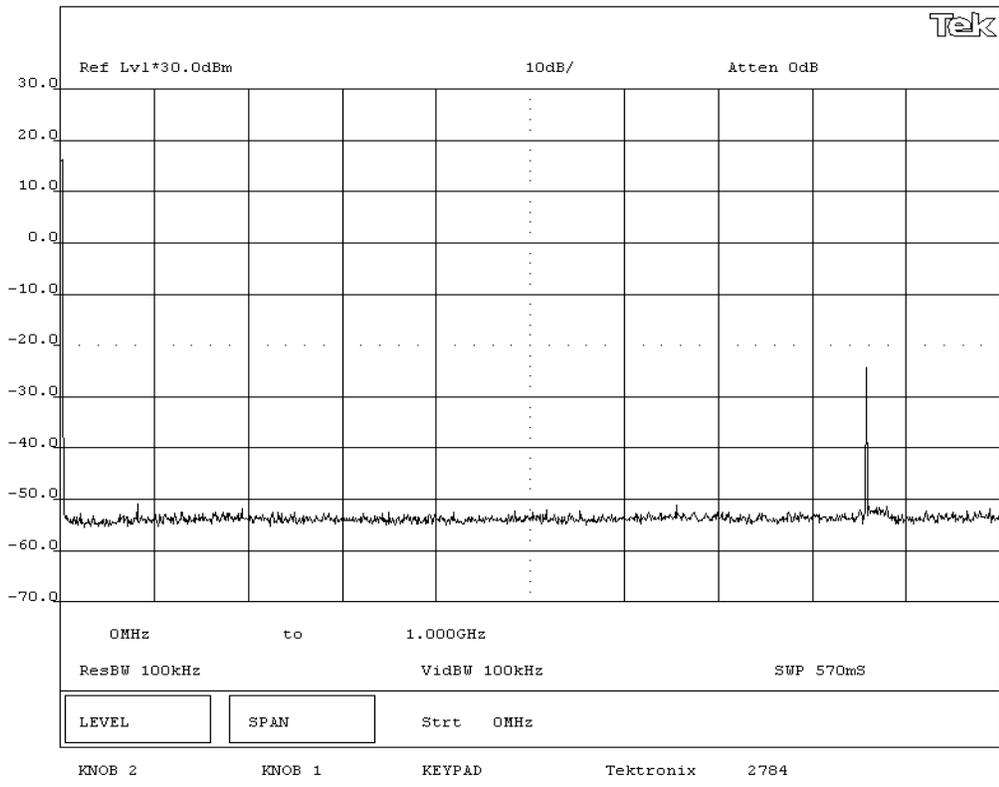
DEVIATIONS FROM TEST STANDARD
None

REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE
Tested By: 

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - Low Channel 0MHz-1GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/20/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at low output power level (approx. -20 dBm)

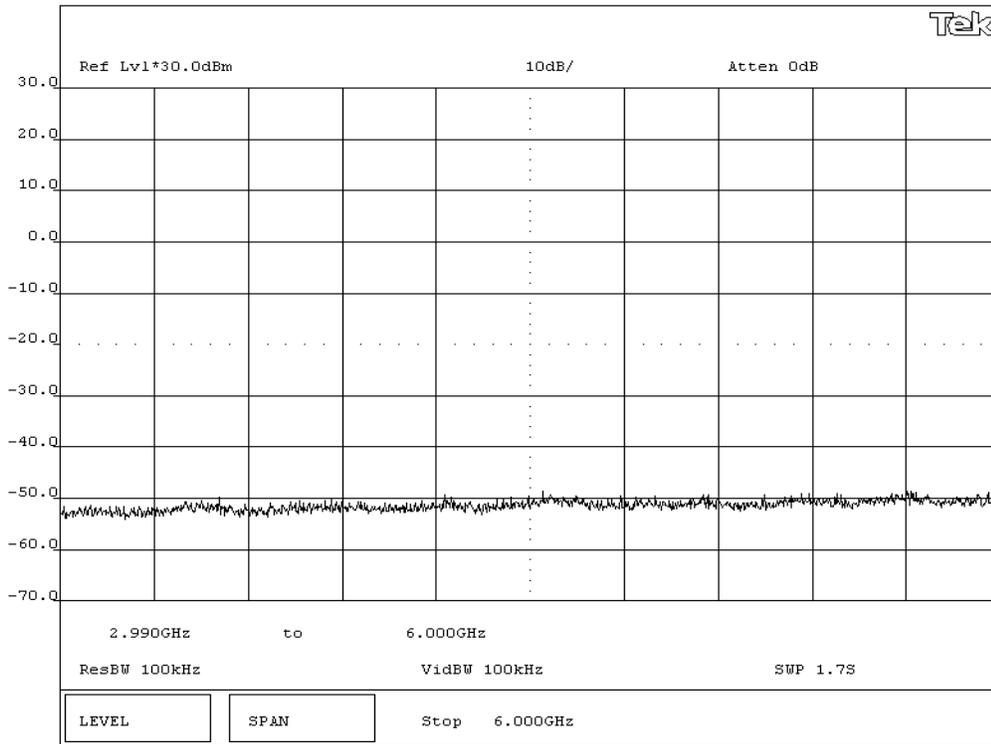
DEVIATIONS FROM TEST STANDARD
None

REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE
Tested By: *JK*

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - Low Channel 3GHz-6GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/20/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

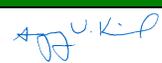
COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at low output power level (approx. -20 dBm)

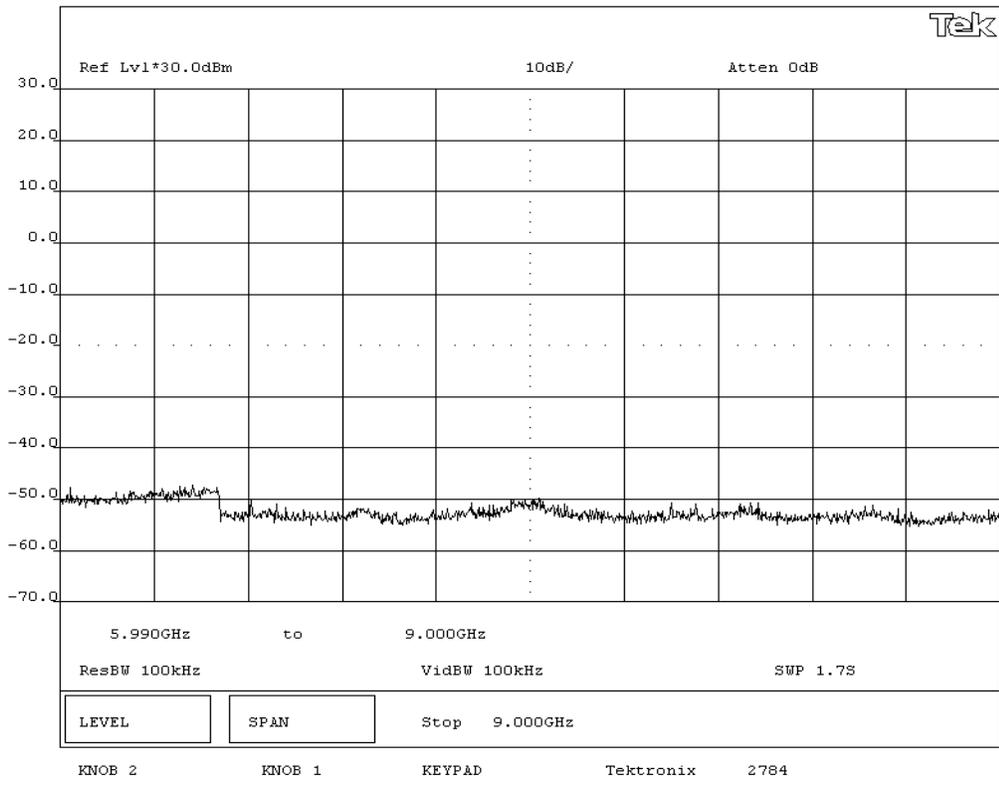
DEVIATIONS FROM TEST STANDARD
None

REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - Low Channel 6GHz - 9GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/20/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

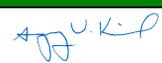
COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at low output power level (approx. -20 dBm)

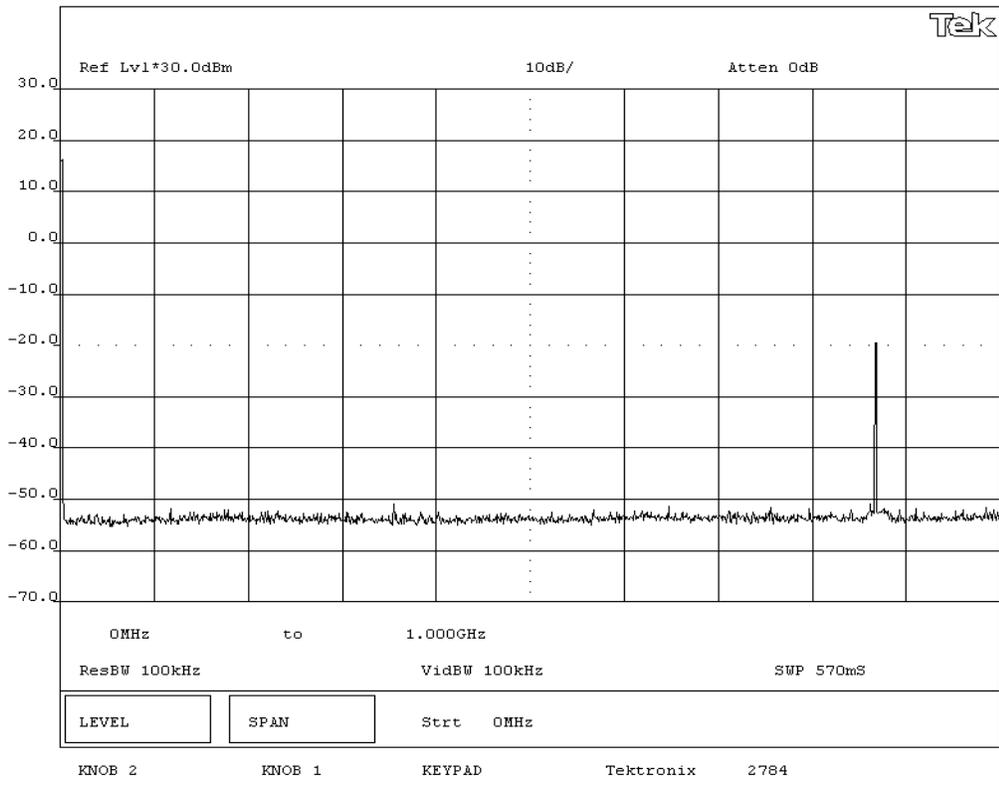
DEVIATIONS FROM TEST STANDARD
None

REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - Mid Channel 0MHz-1GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/20/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

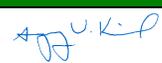
COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at low output power level (approx. -20 dBm)

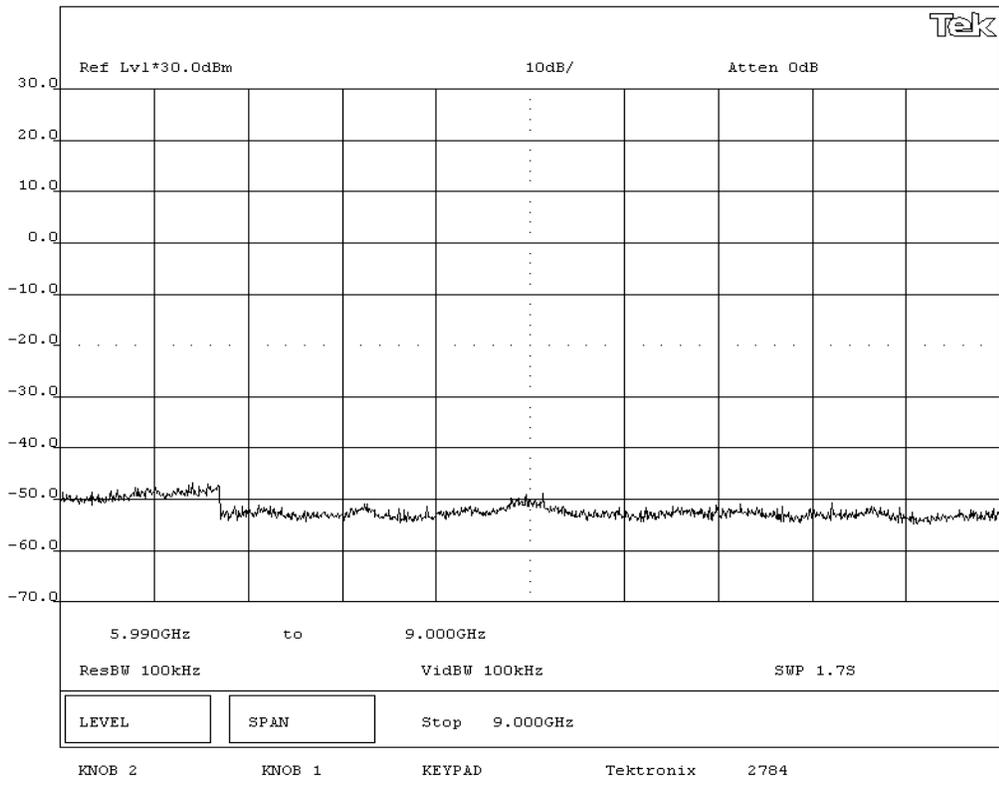
DEVIATIONS FROM TEST STANDARD
None

REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - Mid Channel 6GHz-9GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/20/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at low output power level (approx. -20 dBm)

DEVIATIONS FROM TEST STANDARD
None

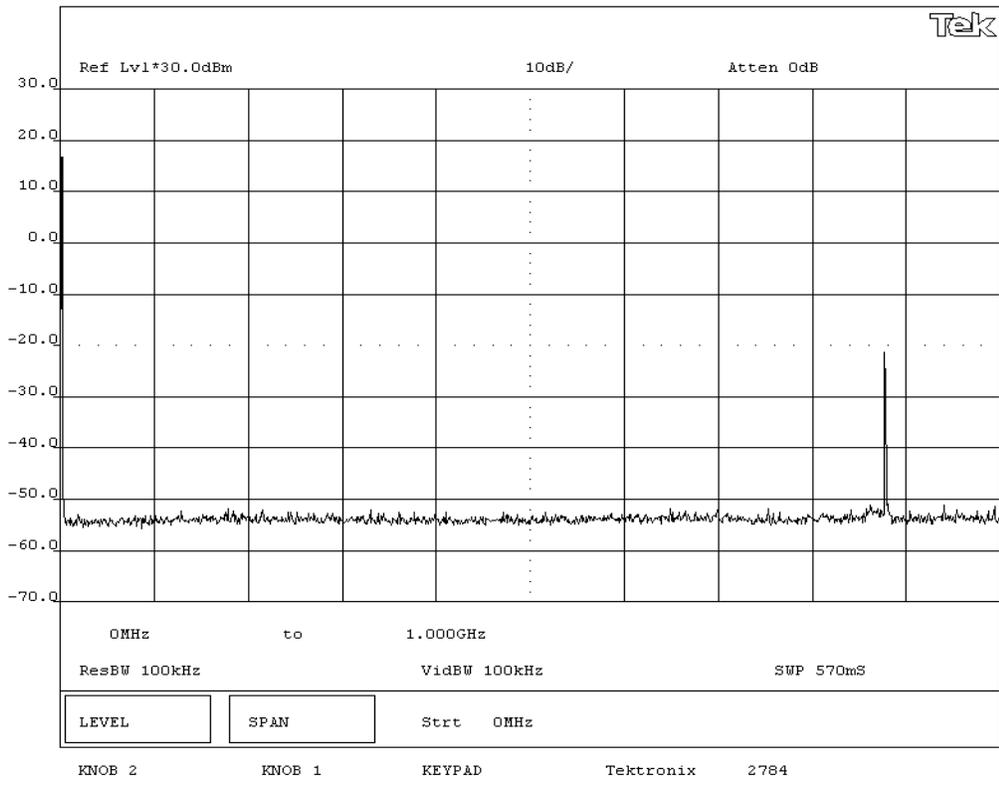
REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE

Tested By: *Greg Kiemel*

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - High Channel 0MHz-1GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at low output power level (approx. -20 dBm)

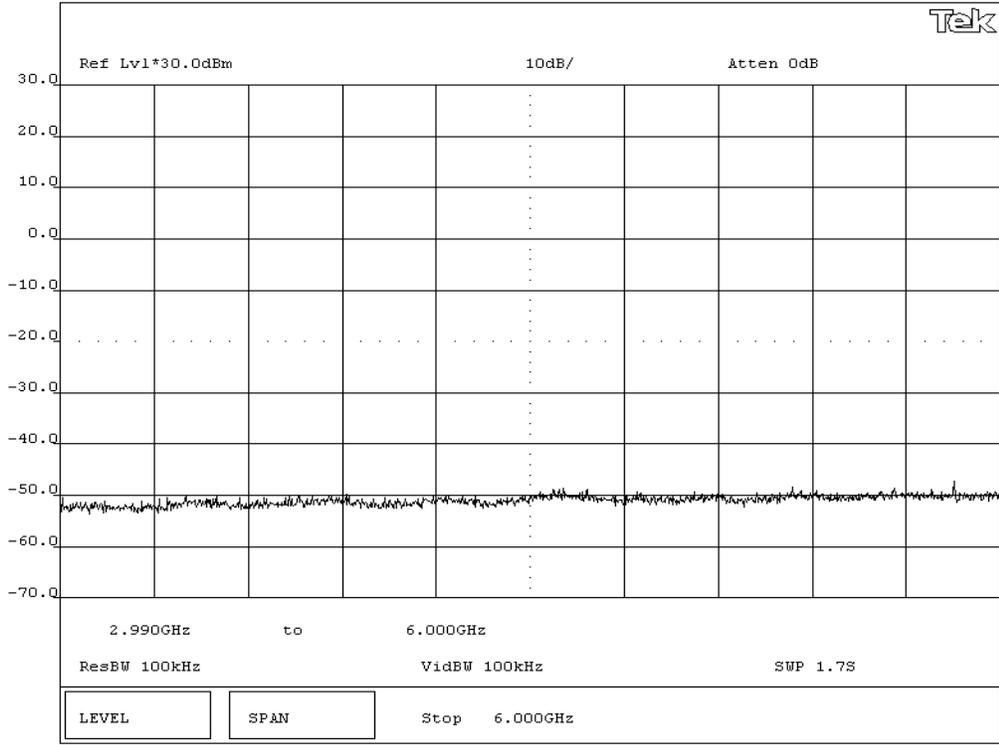
DEVIATIONS FROM TEST STANDARD
None

REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE
Tested By: *JK*

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - High Channel 3GHz-6GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/20/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at low output power level (approx. -20 dBm)

DEVIATIONS FROM TEST STANDARD
None

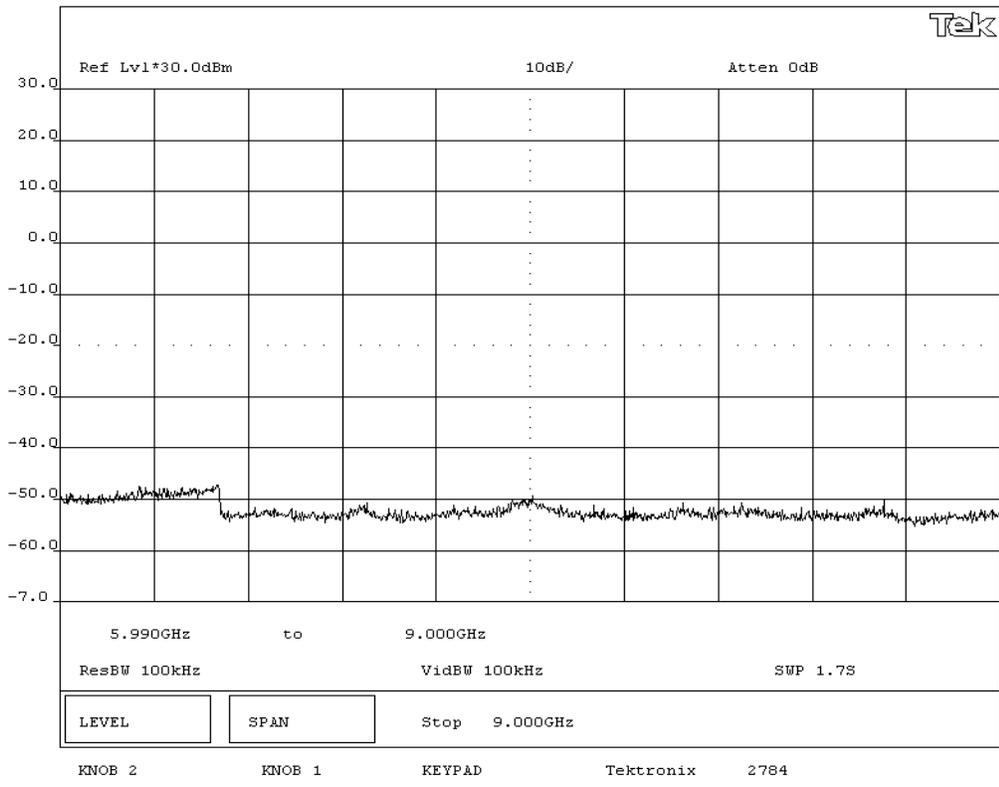
REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE


 Tested By: _____

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - High Channel 6GHz-9GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at highest output power level (approx. +20 dBm)

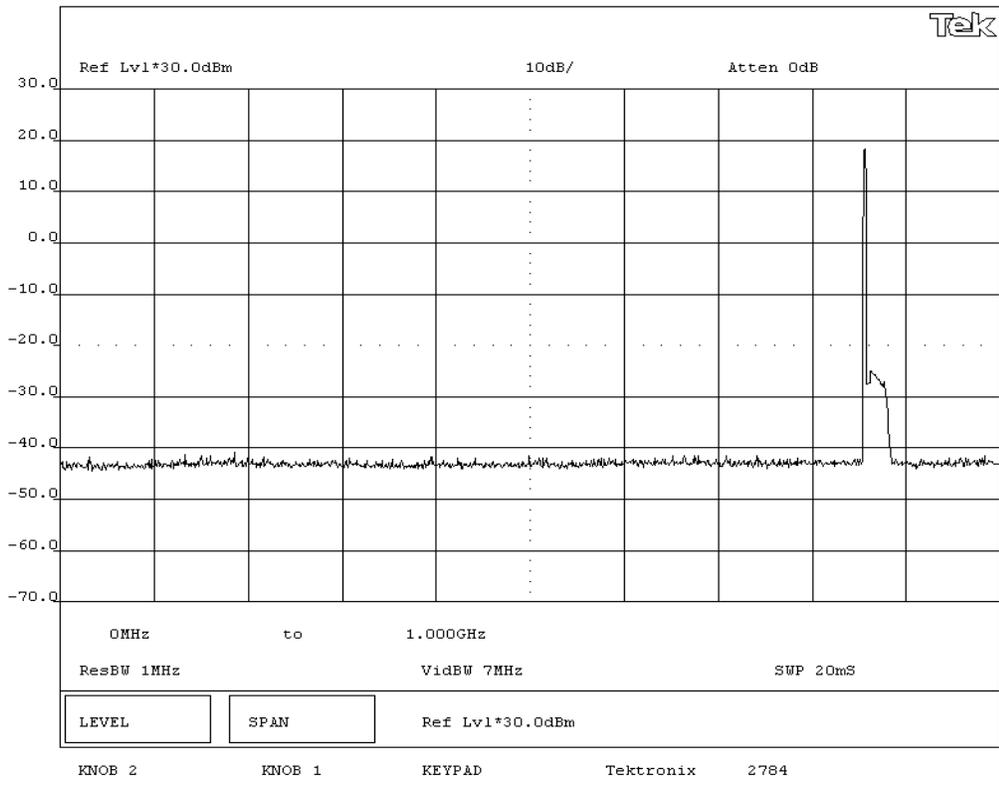
DEVIATIONS FROM TEST STANDARD
None

REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE
Tested By: 

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - Low Channel 0MHz-1GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at highest output power level (approx. +20 dBm)

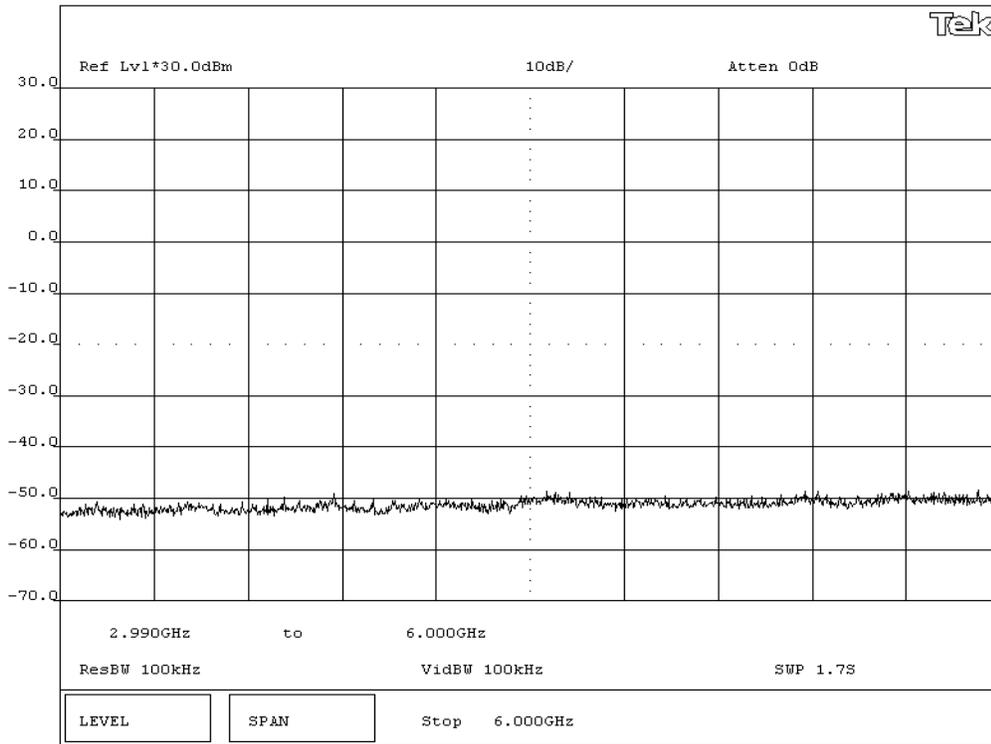
DEVIATIONS FROM TEST STANDARD
None

REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE
Tested By: *JK*

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - Low Channel 3GHz-6GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/20/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at highest output power level (approx. +20 dBm)

DEVIATIONS FROM TEST STANDARD
None

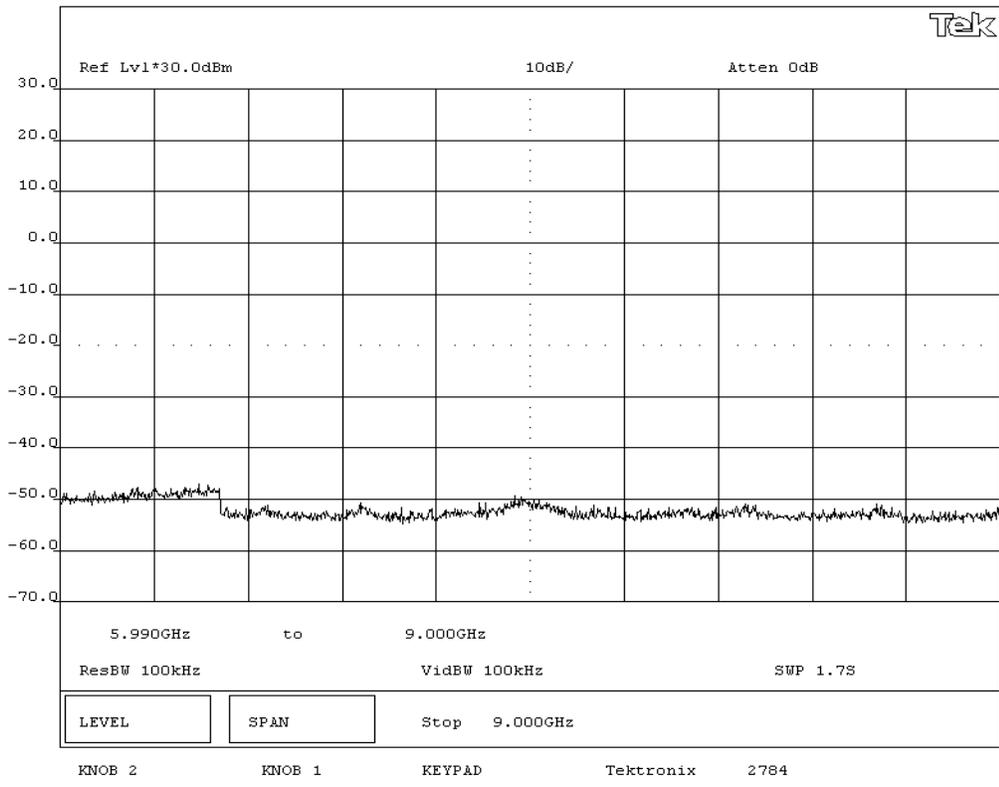
REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - Low Channel 6GHz - 9GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

COMMENTS
Tested in System Configuration

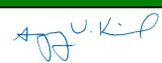
EUT OPERATING MODES
With modulation at highest output power level (approx. +20 dBm)

DEVIATIONS FROM TEST STANDARD
None

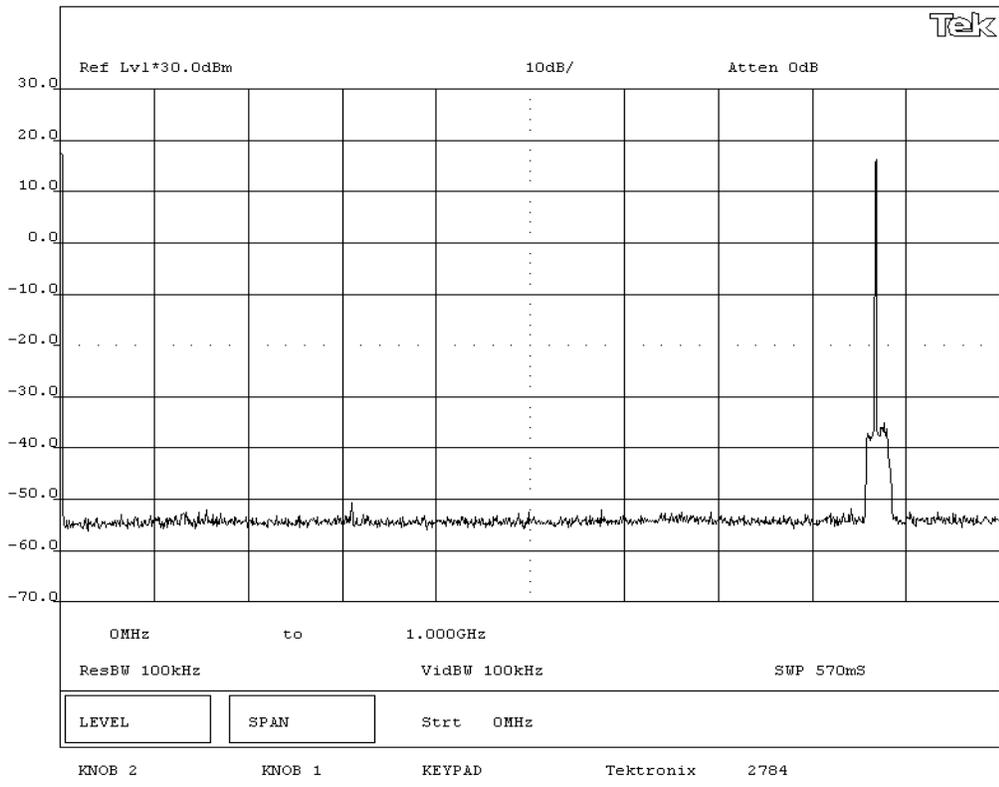
REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE


 Tested By: _____

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - Mid Channel 0MHz-1GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at highest output power level (approx. +20 dBm)

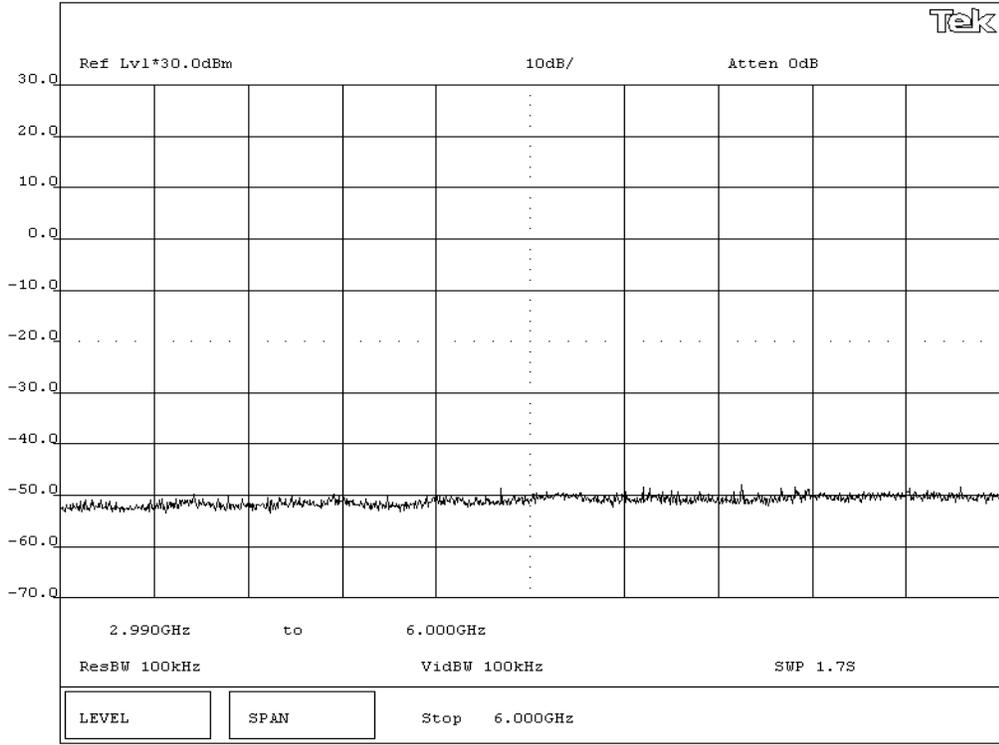
DEVIATIONS FROM TEST STANDARD
None

REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE
Tested By: *JK*

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - Mid Channel 3GHz - 6GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at highest output power level (approx. +20 dBm)

DEVIATIONS FROM TEST STANDARD
None

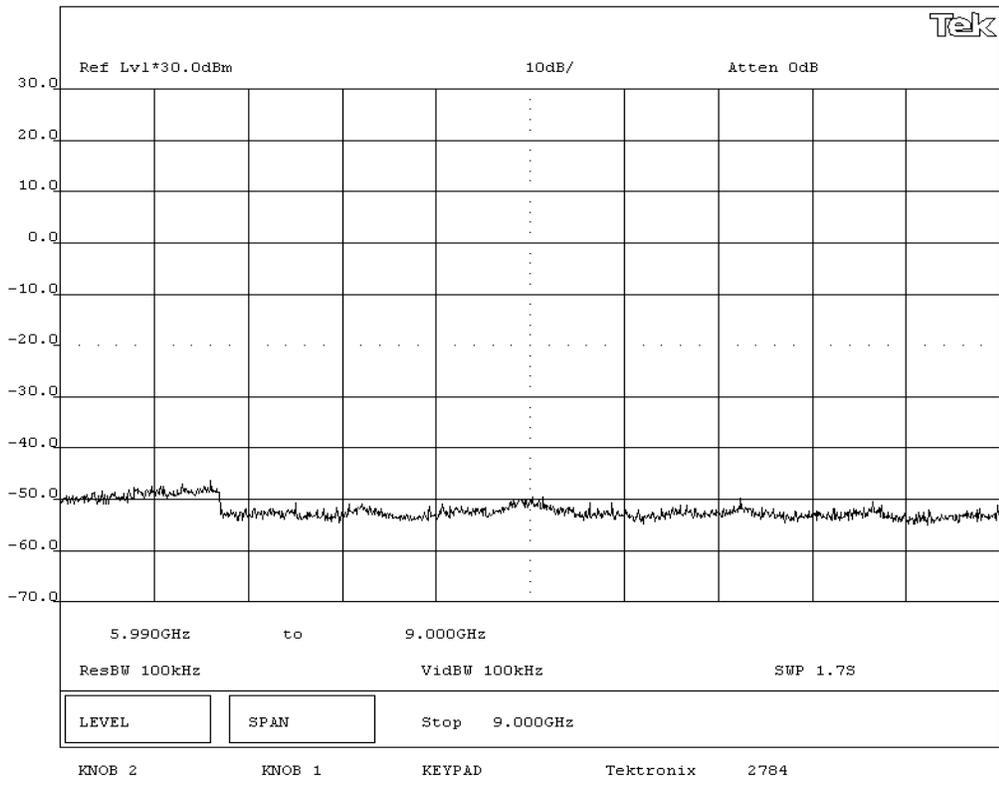
REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - Mid Channel 6GHz-9GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

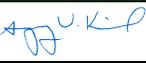
COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at highest output power level (approx. +20 dBm)

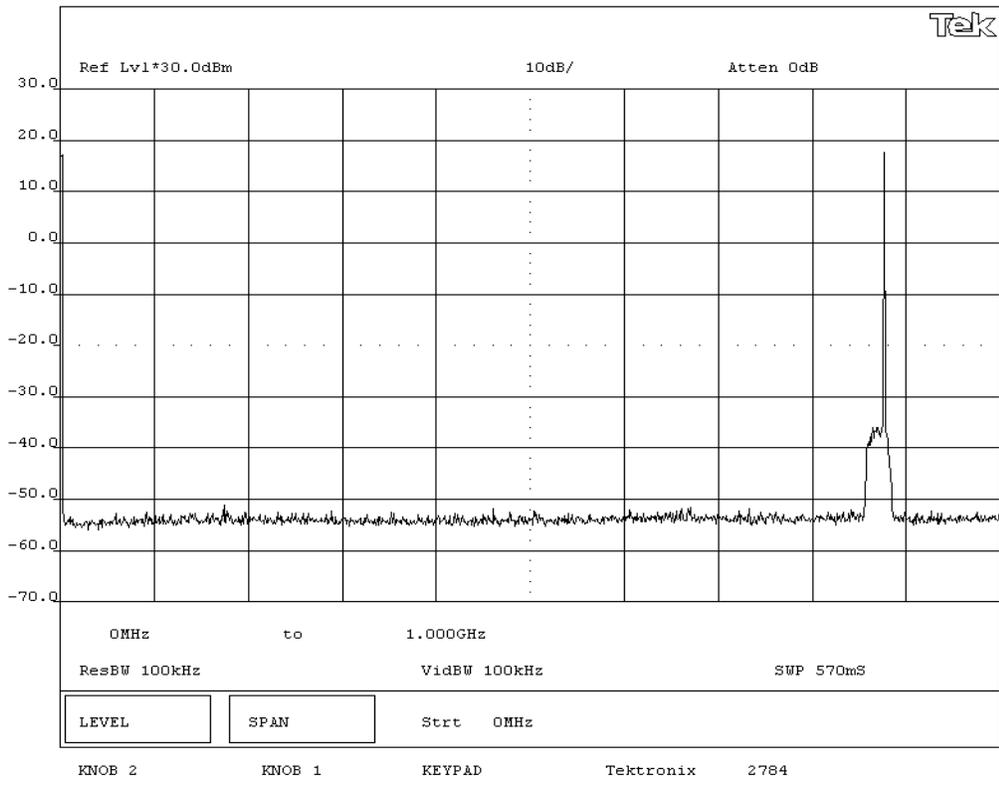
DEVIATIONS FROM TEST STANDARD
None

REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - High Channel 0MHz-1GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/20/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at highest output power level (approx. +20 dBm)

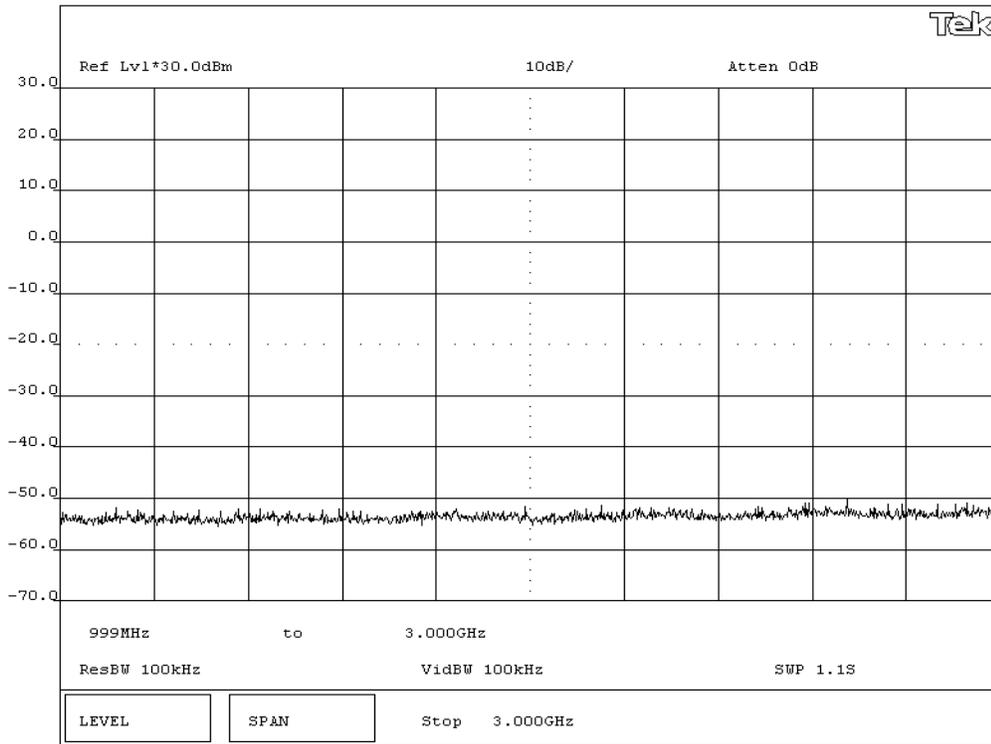
DEVIATIONS FROM TEST STANDARD
None

REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE
Tested By: *JK*

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - High Channel 1GHz-3GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/20/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

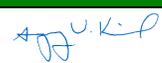
COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at highest output power level (approx. +20 dBm)

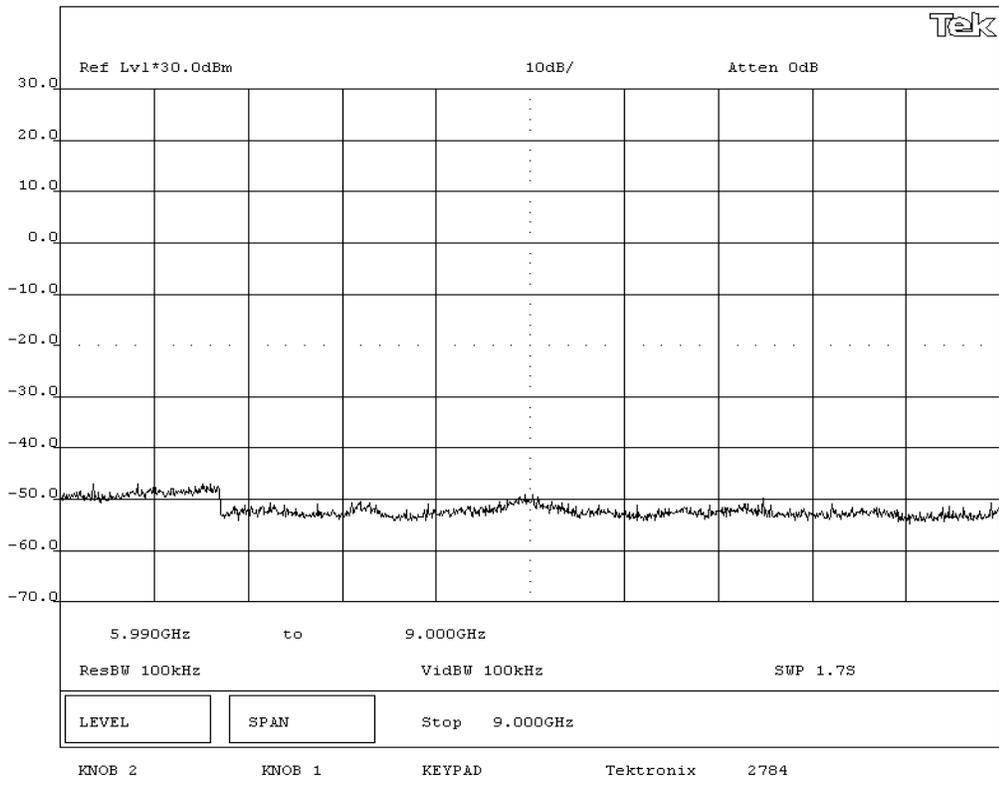
DEVIATIONS FROM TEST STANDARD
None

REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - High Channel 6GHz-9GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

COMMENTS

Tested in System Configuration

EUT OPERATING MODES

With modulation at highest output power level (approx. +20 dBm)

DEVIATIONS FROM TEST STANDARD

None

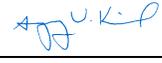
REQUIREMENTS

Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS

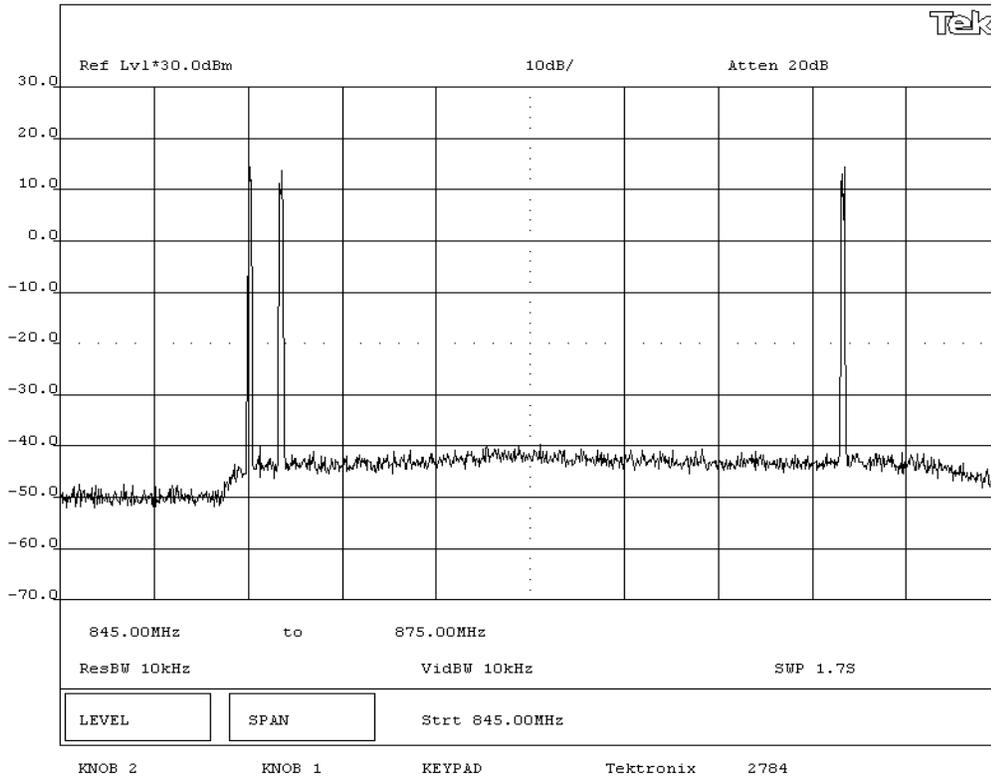
Pass

SIGNATURE

Tested By: 

DESCRIPTION OF TEST

Antenna Conducted Spurious Emissions - Three Signal IM Test, In Band



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at highest output power level (approx. +20 dBm)

DEVIATIONS FROM TEST STANDARD
None

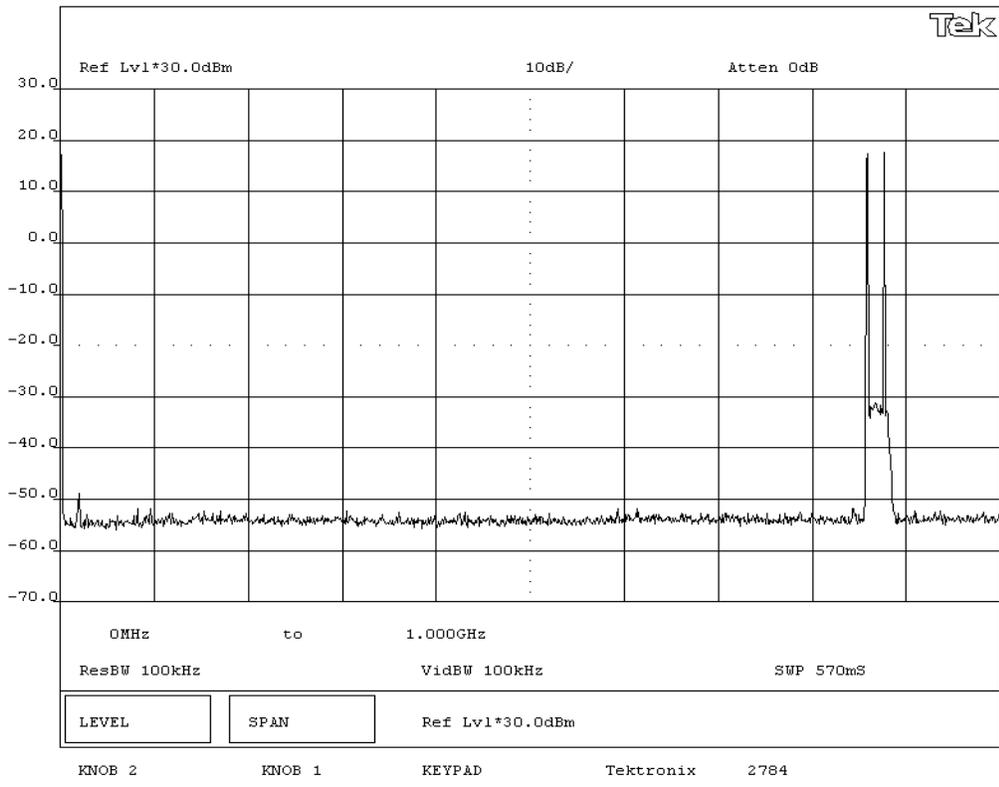
REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE

Tested By: *Greg Kiemel*

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - Three Signal IM Test, 0MHz-1GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/20/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/03/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

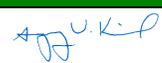
COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at highest output power level (approx. +20 dBm)

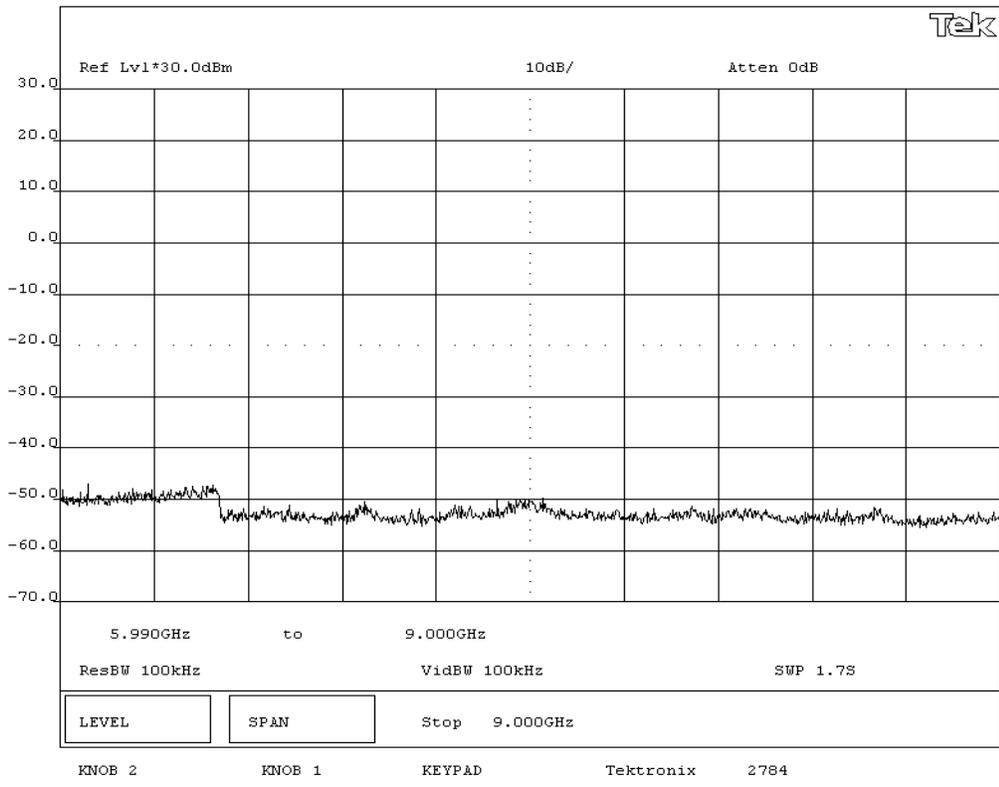
DEVIATIONS FROM TEST STANDARD
None

REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - Three Signal IM Test, 6GHz-9GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/04/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

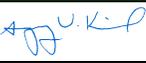
COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at highest output power level (approx. +20 dBm)

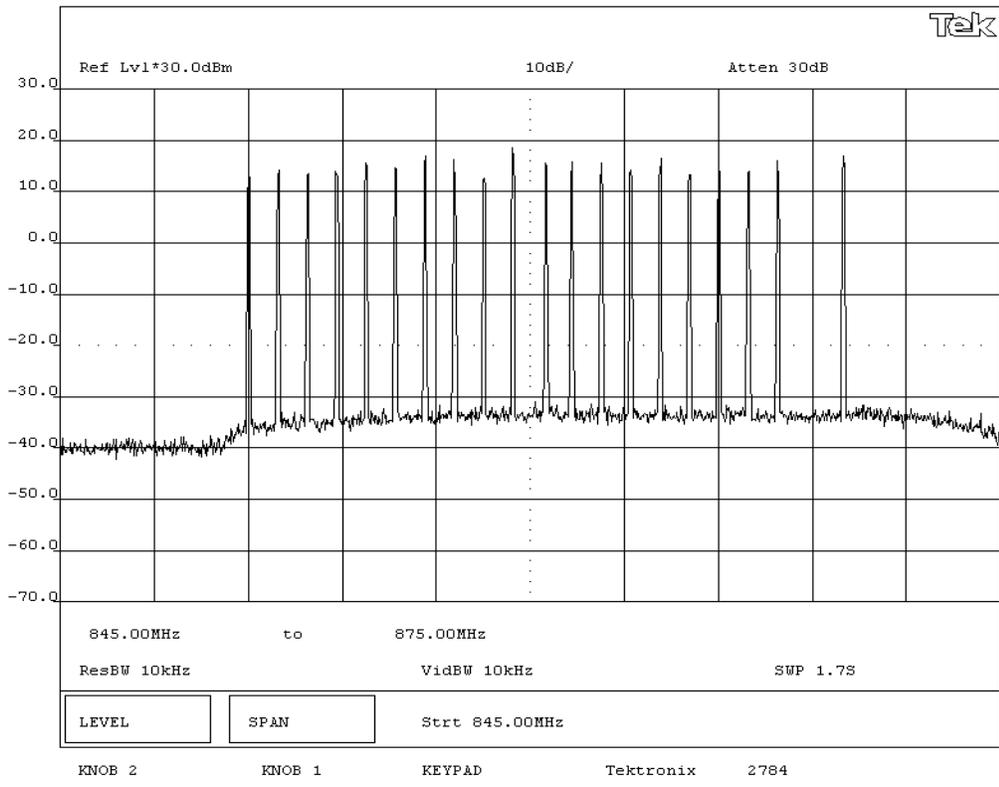
DEVIATIONS FROM TEST STANDARD
None

REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE
Tested By: 

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - 20 Signal IM Test, In Band



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/04/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at highest output power level (approx. +20 dBm)

DEVIATIONS FROM TEST STANDARD
None

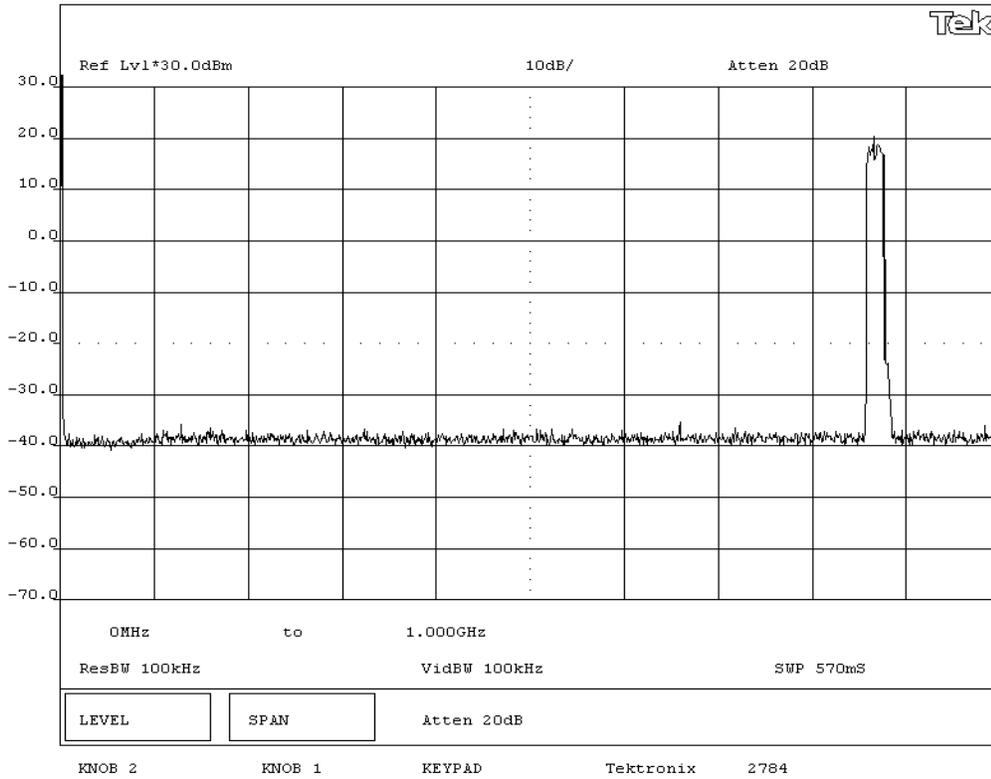
REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - 20 Signal IM Test, 0MHz-1GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/04/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Humidity: 41%
	Power: 48 Vdc
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at highest output power level (approx. +20 dBm)

DEVIATIONS FROM TEST STANDARD
None

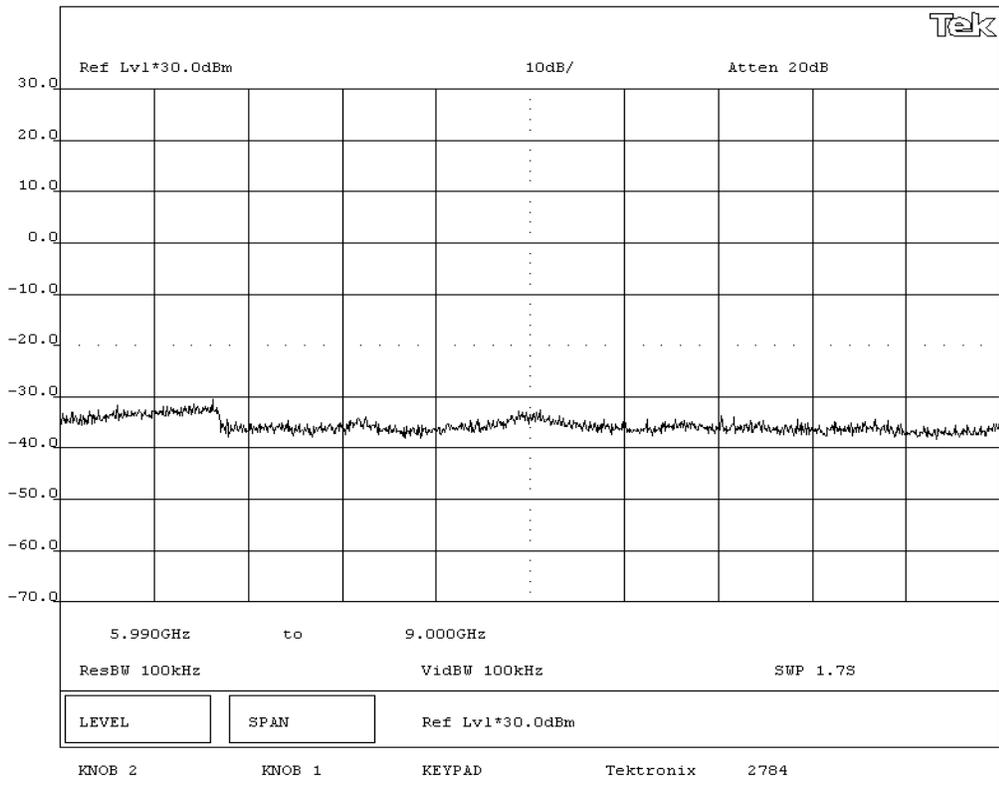
REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE

Tested By: *Greg Kiemel*

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - 20 Signal IM Test, 6GHz-9GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/04/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at highest output power level (approx. +20 dBm)

DEVIATIONS FROM TEST STANDARD
None

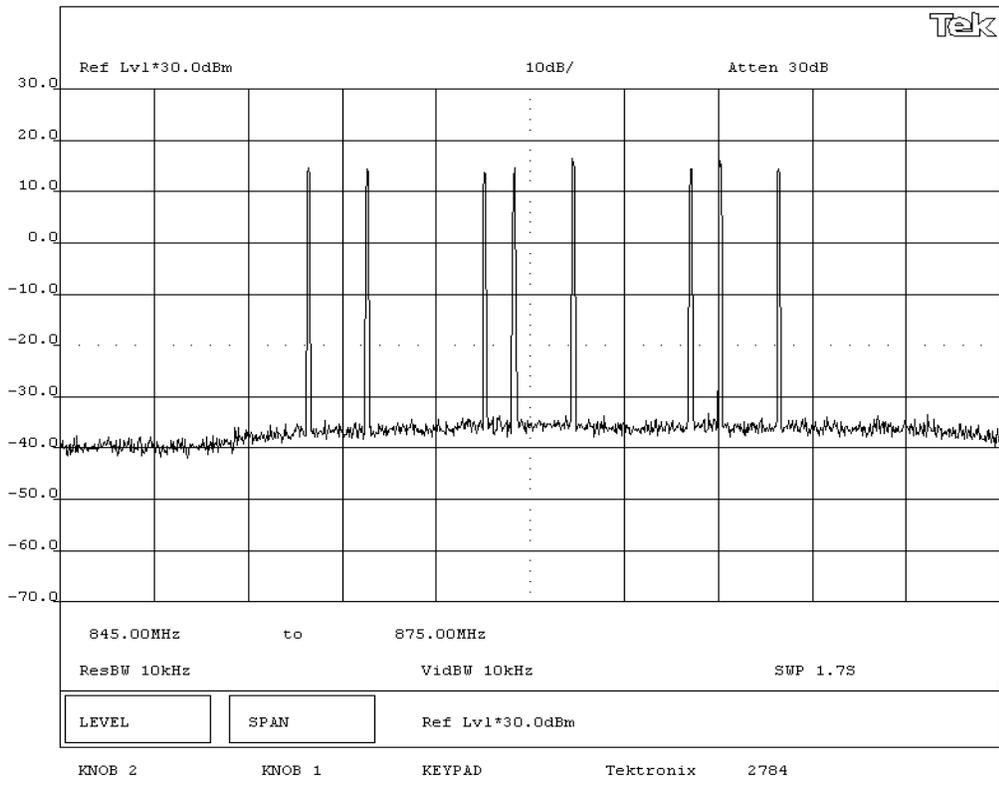
REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - 8 Signal IM Test, In Band



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/04/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

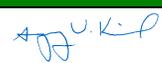
COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at highest output power level (approx. +20 dBm)

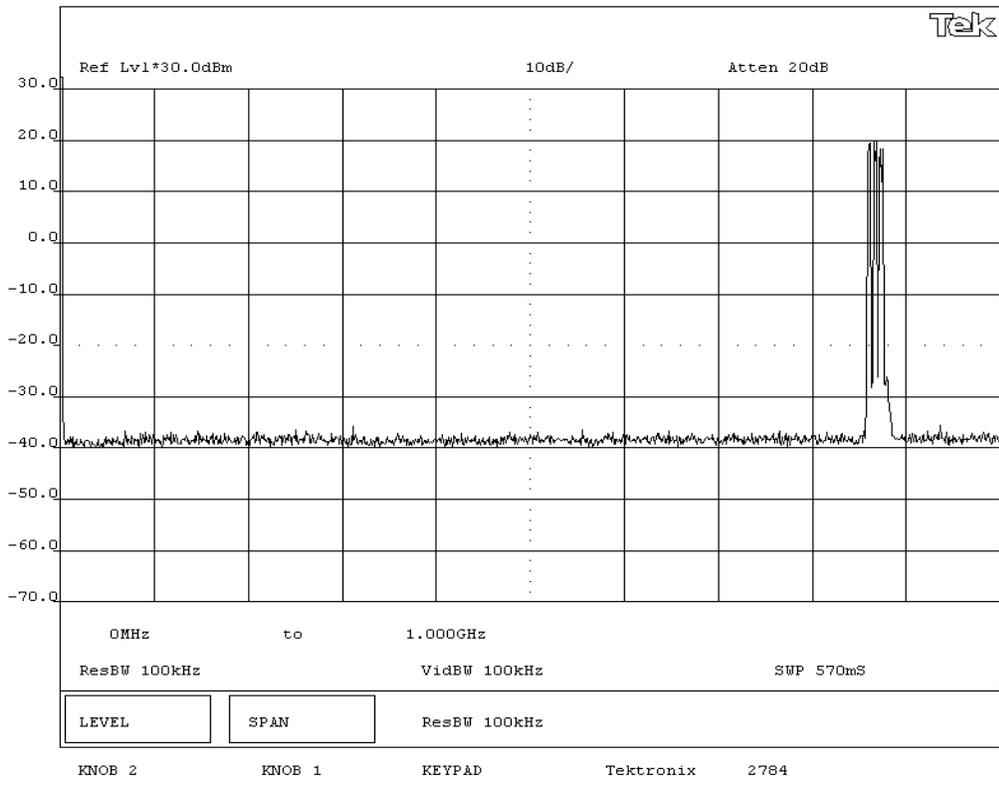
DEVIATIONS FROM TEST STANDARD
None

REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

RESULTS
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - 8 Signal IM Test, 0MHz-1GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT: MC Series System	Work Order: RAFN0040
Serial Number: Engineering Production Unit #1	Date: 08/04/04
Customer: Radioframe Networks, Inc.	Temperature: 73 F
Attendees: Jeff Franck	Tested by: Greg Kiemel
Customer Ref. No.: N/A	Power: 48 Vdc
	Humidity: 41%
	Job Site: Off-site

TEST SPECIFICATIONS			
Specification: 47 CFR 2.1051 & 90.691	Year: 2003	Method: TIA / EIA - 603	Year: 2001

SAMPLE CALCULATIONS

COMMENTS
Tested in System Configuration

EUT OPERATING MODES
With modulation at highest output power level (approx. +20 dBm)

DEVIATIONS FROM TEST STANDARD
None

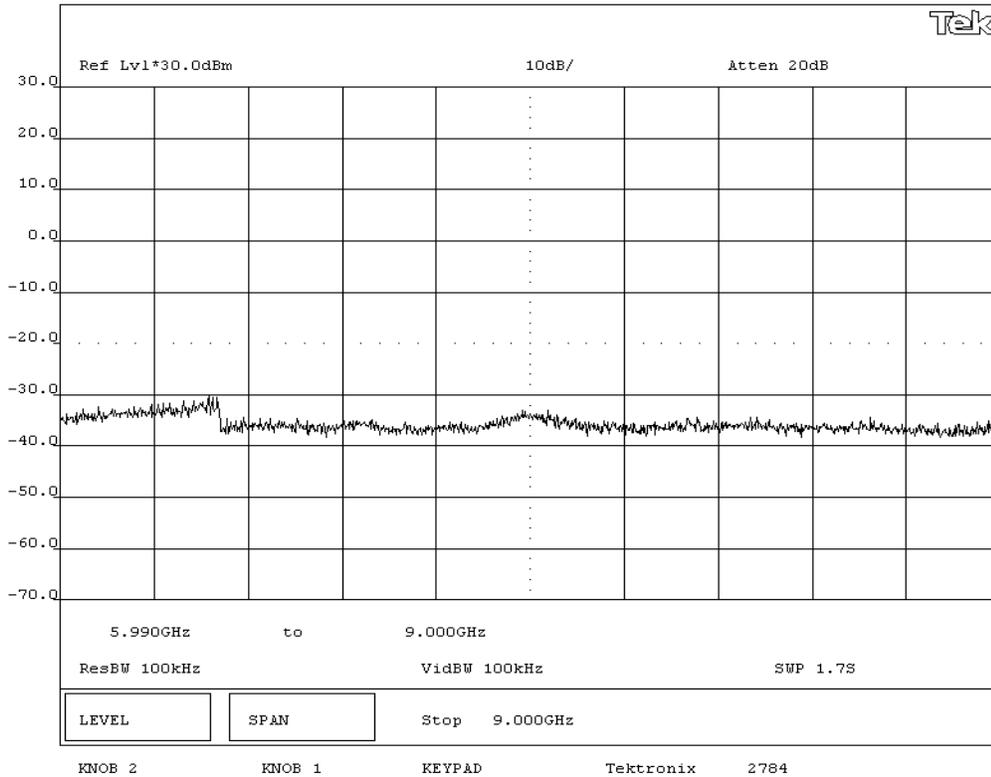
REQUIREMENTS
Maximum level of any spurious emission must be attenuated below the specified emission mask.

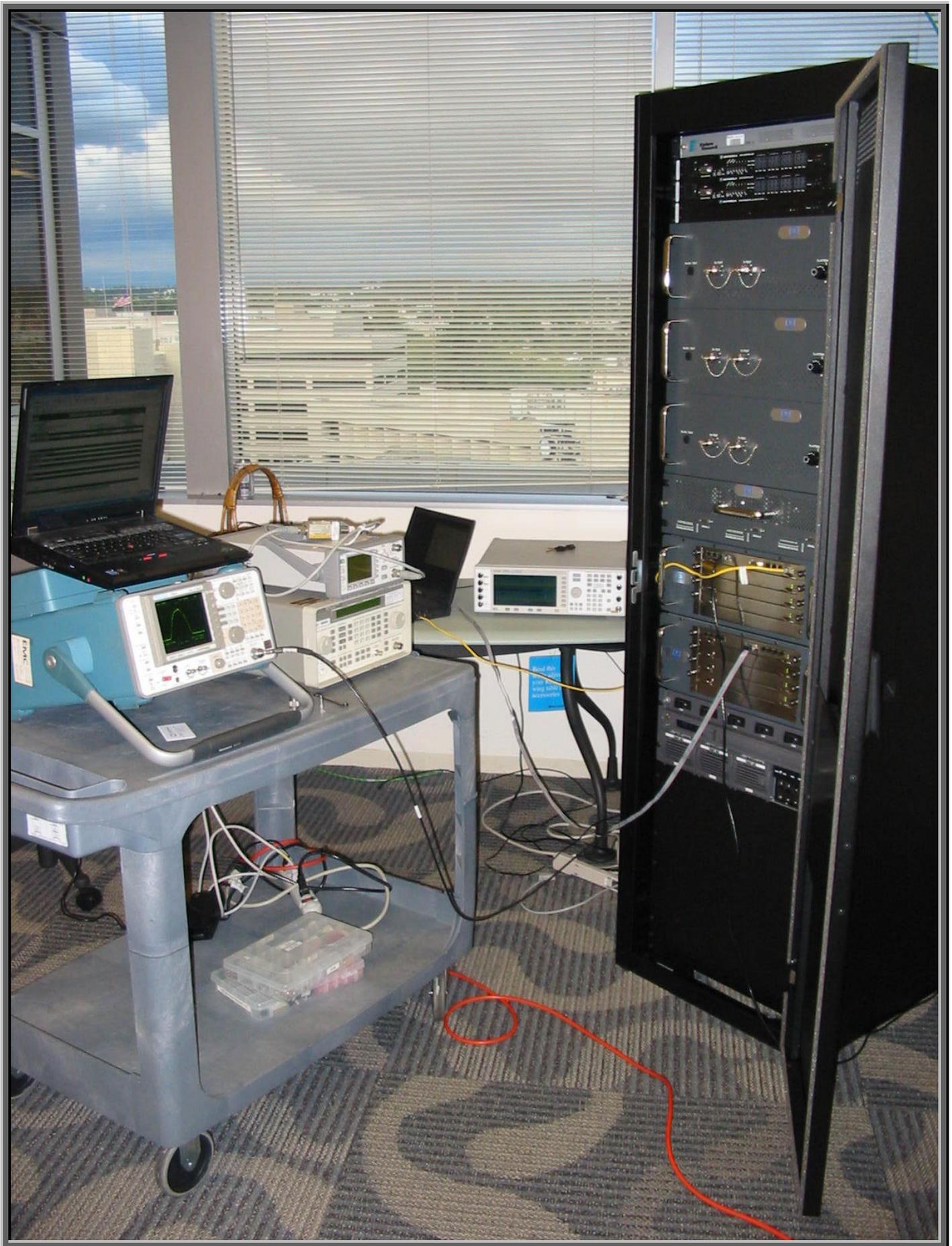
RESULTS
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST
Antenna Conducted Spurious Emissions - 8 Signal IM Test, 6GHz-9GHz





Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:

20 channels distributed across the band (omni mode)

Operating Modes Investigated:

Receive Mode

Power Input Settings Investigated:

-48 Vdc.

Software\Firmware Applied During Test

Exercise software	Standard Production Software	Version	N/A
Description			
The system was tested using standard operating production software to exercise the functions of the device during the testing.			

EUT and Peripherals

Description	Manufacturer	Model/Part Number	Serial Number
iDEN Radio Base Station	Radio Frame Networks, Inc.	MC Series System	Engineering Production Unit #1
Subset of MC Series System	Radio Frame Networks, Inc.	PDU	Unknown
Subset of MC Series System	Radio Frame Networks, Inc.	RF Shelf	Unknown
Subset of MC Series System	Radio Frame Networks, Inc.	Radio Blade Shelf	Unknown
Subset of MC Series System	Radio Frame Networks, Inc.	Base Interface Chassis (BIC)	Unknown
Subset of MC Series System	Radio Frame Networks, Inc.	Airlink Interface Chassis (AIC)	Unknown

Remote Equipment Outside of Test Setup Boundary

Description	Manufacturer	Model/Part Number	Serial Number
Clock Source	Motorola	Unknown	Unknown
Equipment isolated from the EUT so as not to contribute to the measurement result is considered to be outside the test setup boundary			

Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Clock Source	Yes	5.0	No	Base Interface Chassis (BIC)	Clock Source
DC Power	No	6	No	PDU	DC Power

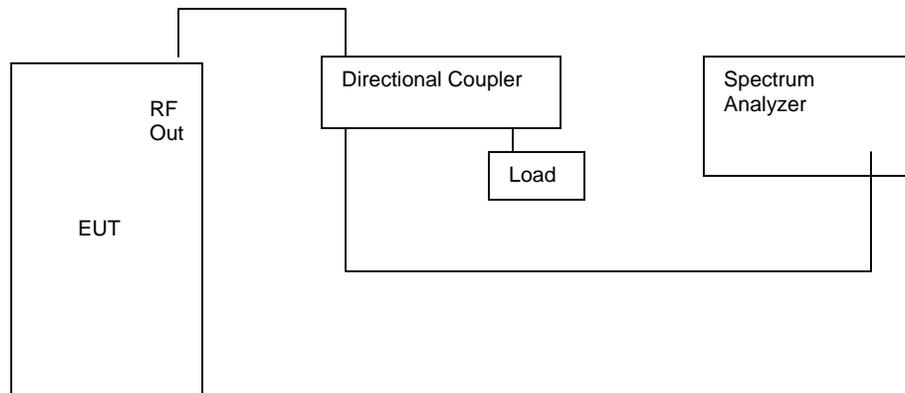
Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Tektronix	2784	AAO	02/26/2003	24 mo

Test Description

Requirement: Per 47 CFR 15.111, receivers that operate (tune) in the frequency range 30 to 960 MHz that provide terminals for the connection of an external receiving antenna may be tested to demonstrate compliance with the provisions of Section 15.109 with the antenna terminals terminated, provided the conducted power at the antenna terminals at any frequency within the range of measurements specified in Section 15.33 (30 MHz to 5 GHz for cellular receiver) does not exceed 2.0 nW (-57 dBm).

Configuration: A spectrum analyzer was used to scan from 30 to 5 GHz. A 100 kHz resolution bandwidth was used. No video filtering was employed. A 20dB external attenuator was used on the RF input of the spectrum analyzer.

Test Setup Diagram

Completed by:

EMC EMISSIONS DATA SHEET Rev BETA 01/30/01

EUT: MC Series	Work Order: RAFN0042
Serial Number: Engineering Production Unit #1	Date: 10/20/04
Customer: Radio Frame Networks	Temperature: 74° F
Attendees: Dean Bush	Tested by: Rod Peloquin
Customer Ref. No.: N/A	Power: -48 VDC
	Humidity: 48% RH
	Job Site: EV01

TEST SPECIFICATIONS			
Specification: 47 CFR 15.111(a)	Year: 2004	Method: ANSI C63.4	Year: 2003

SAMPLE CALCULATIONS

COMMENTS

20 channels omni

EUT OPERATING MODES

Receive mode

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

The power at the antenna terminal at any frequency within the range of measurements specified in 15.111 shall not exceed 2.0 nanowatts (-57 dBm).

RESULTS

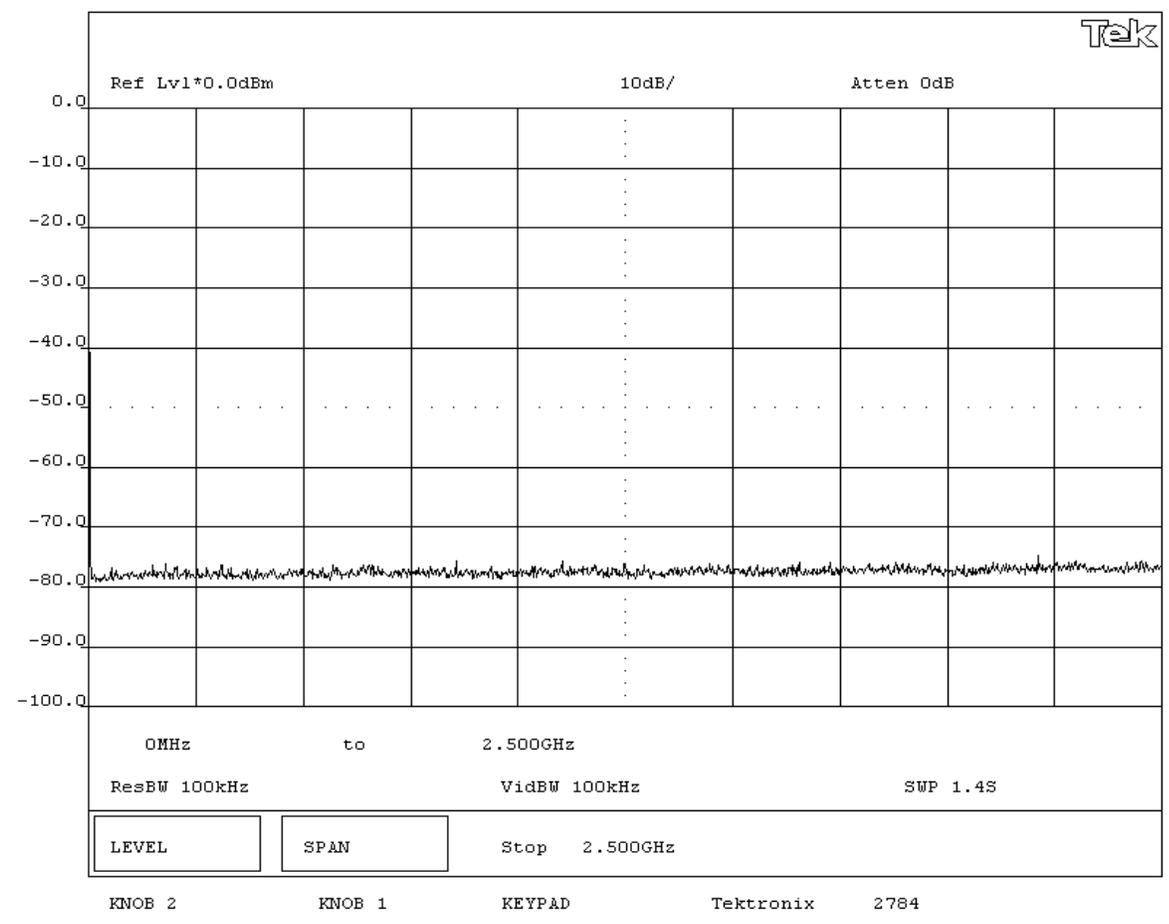
Pass

SIGNATURE

Tested By: *Rod Peloquin*

DESCRIPTION OF TEST

Antenna Conducted Spurious Emissions - 2.5GHz - 5GHz



EMISSIONS DATA SHEET

EUT: MC Series		Work Order: RAFN0042
Serial Number: Engineering Production Unit #1		Date: 10/20/04
Customer: Radio Frame Networks		Temperature: 74° F
Attendees: Dean Bush	Tested by: Rod Peloquin	Humidity: 48% RH
Customer Ref. No.: N/A	Power: -48 VDC	Job Site: EV01

TEST SPECIFICATIONS			
Specification: 47 CFR 15.111(a)	Year: 2004	Method: ANSI C63.4	Year: 2003

SAMPLE CALCULATIONS			

COMMENTS

20 channels omni

EUT OPERATING MODES

Receive mode

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

The power at the antenna terminal at any frequency within the range of measurements specified in 15.111 shall not exceed 2.0 nanowatts (-57 dBm).

RESULTS

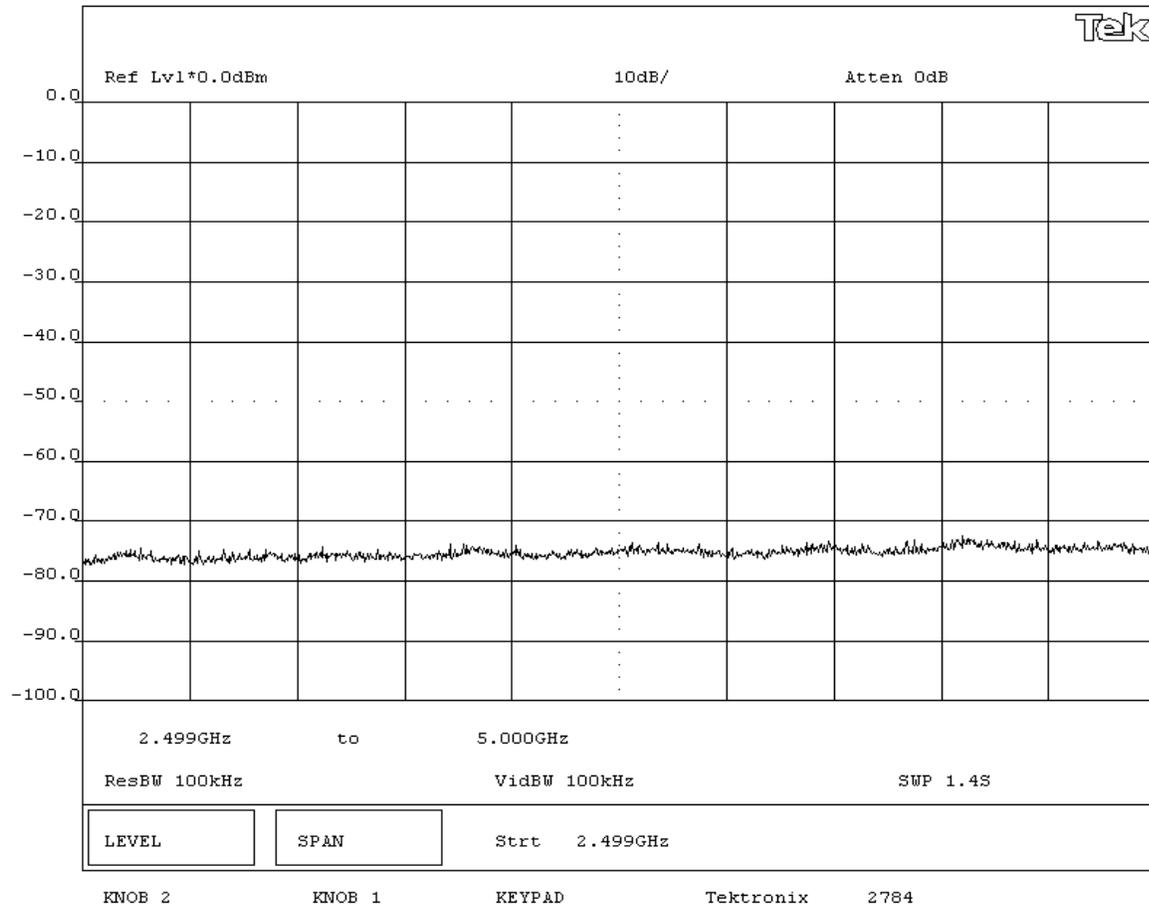
Pass

SIGNATURE

Tested By: 

DESCRIPTION OF TEST

Antenna Conducted Spurious Emissions - 2.5GHz - 5GHz



EMC EMISSIONS DATA SHEET Rev BETA 01/30/01

EUT: MC Series	Work Order: RAFN0042
Serial Number: Engineering Production Unit #1	Date: 10/20/04
Customer: Radio Frame Networks	Temperature: 74° F
Attendees: Dean Bush	Tested by: Rod Peloquin
Customer Ref. No.: N/A	Power: -48 VDC
	Humidity: 48% RH
	Job Site: EV01

TEST SPECIFICATIONS			
Specification: 47 CFR 15.111(a)	Year: 2004	Method: ANSI C63.4	Year: 2003

SAMPLE CALCULATIONS

COMMENTS

20 channels omni

EUT OPERATING MODES

Receive mode

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

The power at the antenna terminal at any frequency within the range of measurements specified in 15.111 shall not exceed 2.0 nanowatts (-57 dBm).

RESULTS

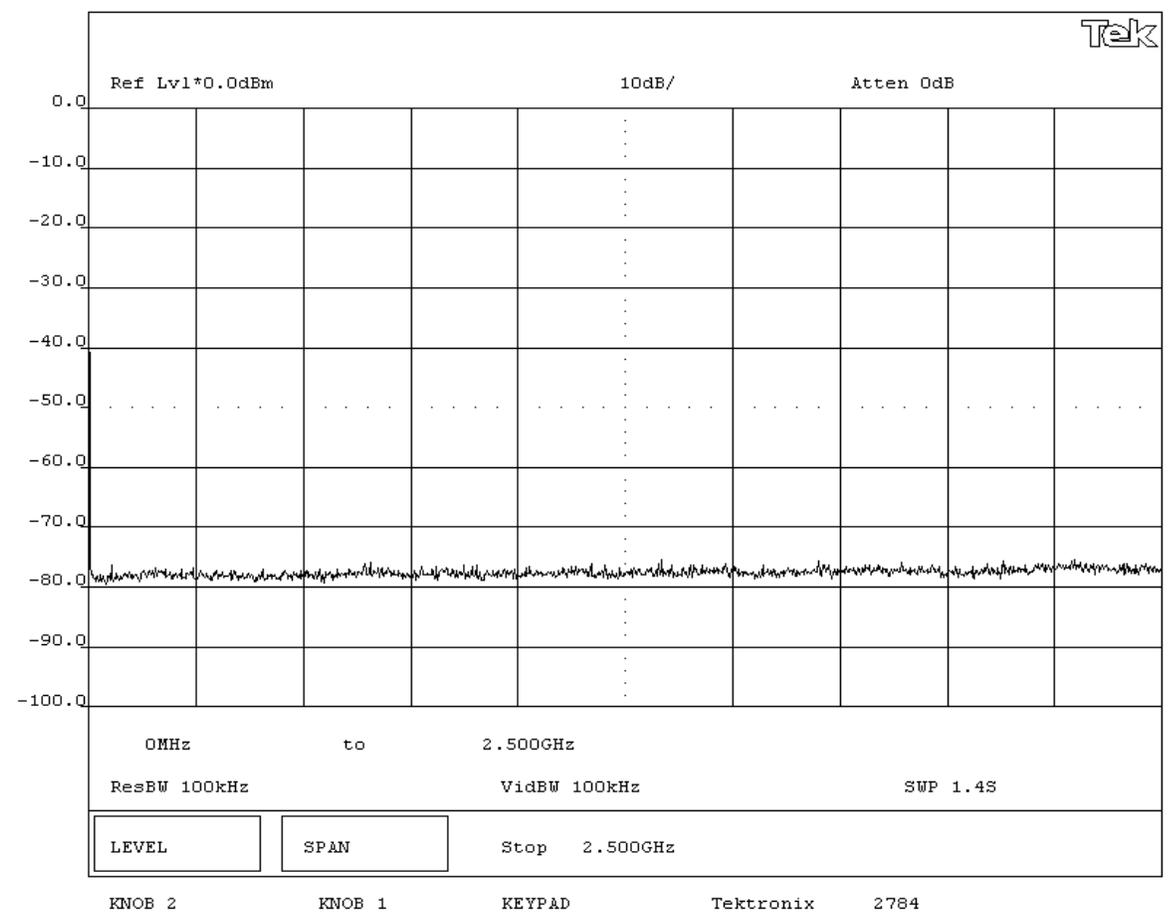
Pass

SIGNATURE

Tested By: *Rod Peloquin*

DESCRIPTION OF TEST

Antenna Conducted Spurious Emissions - 2.5GHz - 5GHz



EMC EMISSIONS DATA SHEET Rev BETA 01/30/01

EUT: MC Series		Work Order: RAFN0042	
Serial Number: Engineering Production Unit #1		Date: 10/20/04	
Customer: Radio Frame Networks		Temperature: 74° F	
Attendees: Dean Bush	Tested by: Rod Peloquin	Humidity: 48% RH	
Customer Ref. No.: N/A	Power: -48 VDC	Job Site: EV01	

TEST SPECIFICATIONS			
Specification: 47 CFR 15.111(a)	Year: 2004	Method: ANSI C63.4	Year: 2003

SAMPLE CALCULATIONS

COMMENTS

20 channels omni

EUT OPERATING MODES

Receive mode

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

The power at the antenna terminal at any frequency within the range of measurements specified in 15.111 shall not exceed 2.0 nanowatts (-57 dBm).

RESULTS

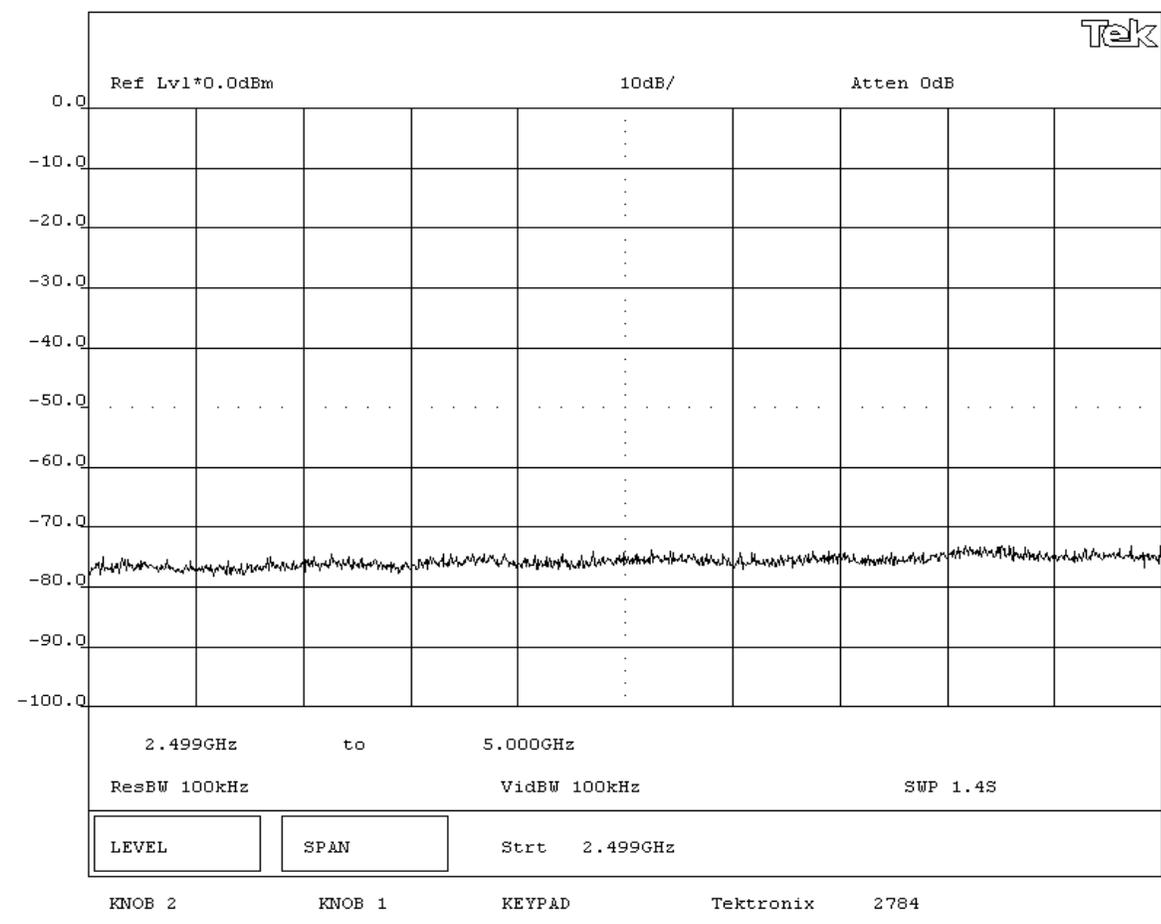
Pass

SIGNATURE

Tested By: *Rod Peloquin*

DESCRIPTION OF TEST

Antenna Conducted Spurious Emissions - 2.5GHz - 5GHz



EMC EMISSIONS DATA SHEET Rev BETA 01/30/01

EUT: MC Series		Work Order: RAFN0042	
Serial Number: Engineering Production Unit #1		Date: 10/20/04	
Customer: Radio Frame Networks		Temperature: 74° F	
Attendees: Dean Bush	Tested by: Rod Peloquin	Humidity: 48% RH	
Customer Ref. No.: N/A	Power: -48 VDC	Job Site: EV01	

TEST SPECIFICATIONS			
Specification: 47 CFR 15.111(a)	Year: 2004	Method: ANSI C63.4	Year: 2003

SAMPLE CALCULATIONS

COMMENTS

20 channels omni

EUT OPERATING MODES

Receive mode

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

The power at the antenna terminal at any frequency within the range of measurements specified in 15.111 shall not exceed 2.0 nanowatts (-57 dBm).

RESULTS

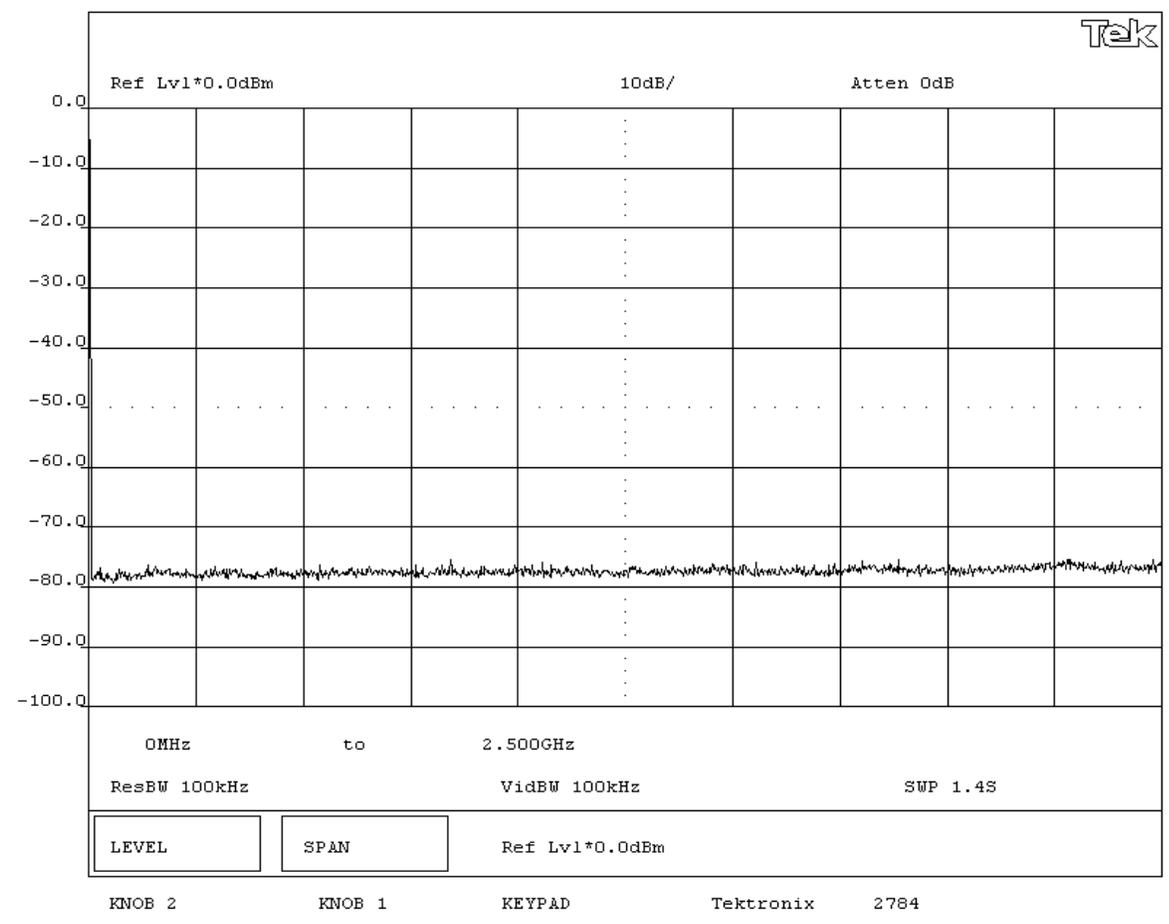
Pass

SIGNATURE

Tested By: *Rod Peloquin*

DESCRIPTION OF TEST

Antenna Conducted Spurious Emissions - 2.5GHz - 5GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT: MC Series		Work Order: RAFN0042
Serial Number: Engineering Production Unit #1		Date: 10/20/04
Customer: Radio Frame Networks		Temperature: 74° F
Attendees: Dean Bush	Tested by: Rod Peloquin	Humidity: 48% RH
Customer Ref. No.: N/A	Power: -48 VDC	Job Site: EV01

TEST SPECIFICATIONS			
Specification: 47 CFR 15.111(a)	Year: 2004	Method: ANSI C63.4	Year: 2003

SAMPLE CALCULATIONS

COMMENTS

20 channels omni

EUT OPERATING MODES

Receive mode

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

The power at the antenna terminal at any frequency within the range of measurements specified in 15.111 shall not exceed 2.0 nanowatts (-57 dBm).

RESULTS

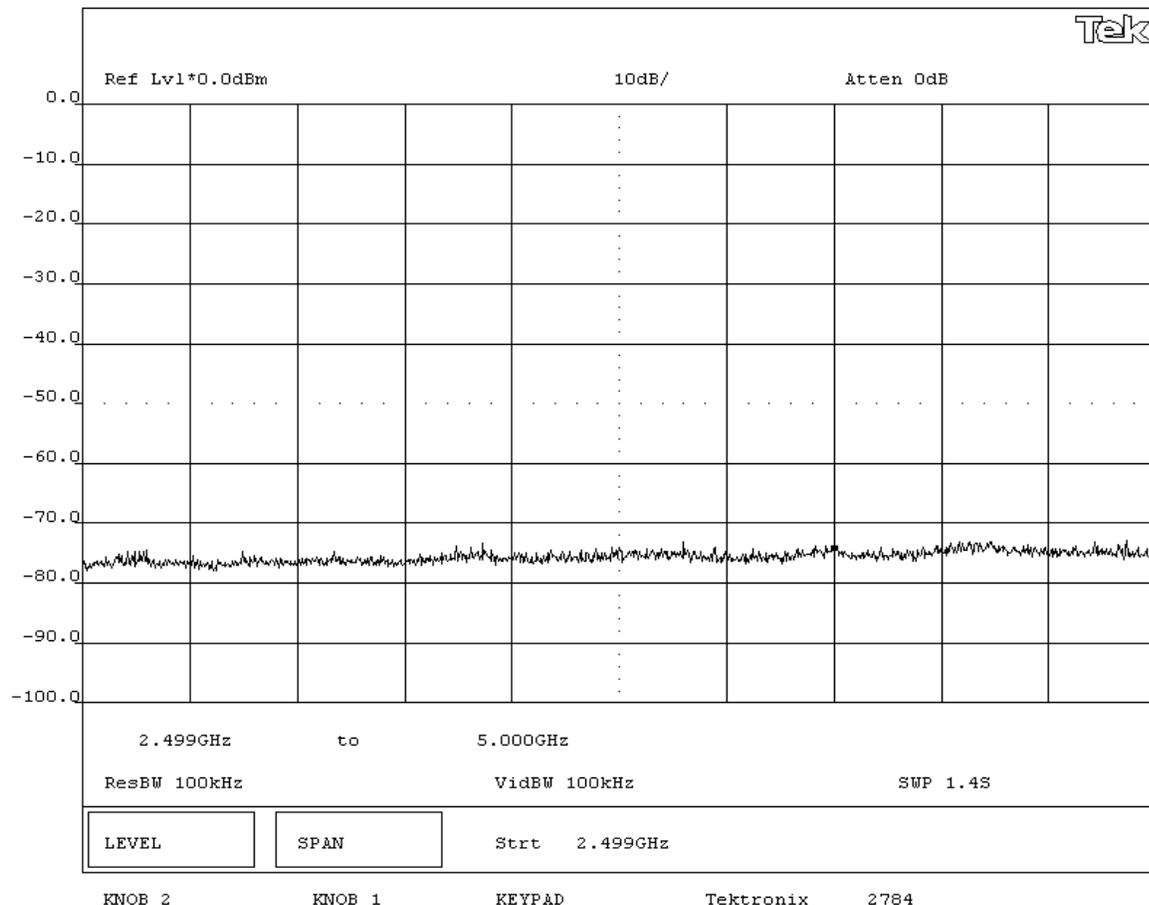
Pass

SIGNATURE

Tested By: 

DESCRIPTION OF TEST

Antenna Conducted Spurious Emissions - 2.5GHz - 5GHz





Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:

Various channels spread equally within the allowable band.

Operating Modes Investigated:

Typical

Other Settings Investigated:

Configured in 20 channel omni mode with maximum base station power configuration.

Frequency Range Investigated

Start Frequency	30 MHz	Stop Frequency	9 GHz
------------------------	--------	-----------------------	-------

Software\Firmware Applied During Test

Exercise software	Standard Production Software	Version	N/A
--------------------------	------------------------------	----------------	-----

Description

The system was tested using standard operating production software to exercise the functions of the device during the testing.

EUT and Peripherals			
Description	Manufacturer	Model/Part Number	Serial Number
iDEN Radio Base Station	Radio Frame Networks, Inc.	MC Series System	Engineering Production Unit #1
Subset of MC Series System	Radio Frame Networks, Inc.	PDU	Unknown
Subset of MC Series System	Radio Frame Networks, Inc.	RF Shelf	Unknown
Subset of MC Series System	Radio Frame Networks, Inc.	Radio Blade Shelf	Unknown
Subset of MC Series System	Radio Frame Networks, Inc.	Base Interface Chassis (BIC)	Unknown
Subset of MC Series System	Radio Frame Networks, Inc.	Airlink Interface Chassis (AIC)	Unknown

Remote Equipment Outside of Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Clock Source	Motorola	Unknown	Unknown
Equipment isolated from the EUT so as not to contribute to the measurement result is considered to be outside the test setup boundary			

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Clock Source	Yes	5.0	No	Base Interface Chassis (BIC)	Clock Source
DC Power	No	6	No	PDU	DC Power

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Hewlett-Packard	8566B	AAL	12/23/2003	13 mo
Antenna, Biconilog	EMCO	3141	AXE	12/03/2003	24 mo
Antenna, Horn	EMCO	3115	AHC	09/07/2004	12 mo
Pre-Amplifier	Amplifier Research	LN1000A	APS	02/05/2004	13 mo
Pre-Amplifier	Miteq	AMF-4D-005180-24-10P	APJ	01/05/2004	13 mo
High Pass Filter	Micro-Tronics	HPM50114	HFN	05/23/2004	13 mo

Test Description

Requirement: Per 2.1053 and 90.691, the Field Strength of Spurious Radiation was measured in the far-field at an FCC Listed OATS up to 9 GHz. Spectrum analyzer, signal generator, and linearly polarized antennas were used to measure radiated harmonics and spurious emissions. The orientation of the EUT and measurement antenna were manipulated to maximize the level of emissions. The EUT was configured to transmit at the highest output power into a dummy load at low, mid, and high frequencies.

The substitution method as described in TIA/EIA-603 Section 2.2.12 was used for the highest spurious emissions. Preliminary measurements were made using the alternate limit at 3 meters of 87.5 dBuV/m.

Test Methodology: For licensed transmitters, the FCC references TIA/EIA-603 as the measurement procedure standard. TIA/EIA-603 Section 2.2.12 describes a method for measuring radiated spurious emissions that utilizes an antenna substitution method:

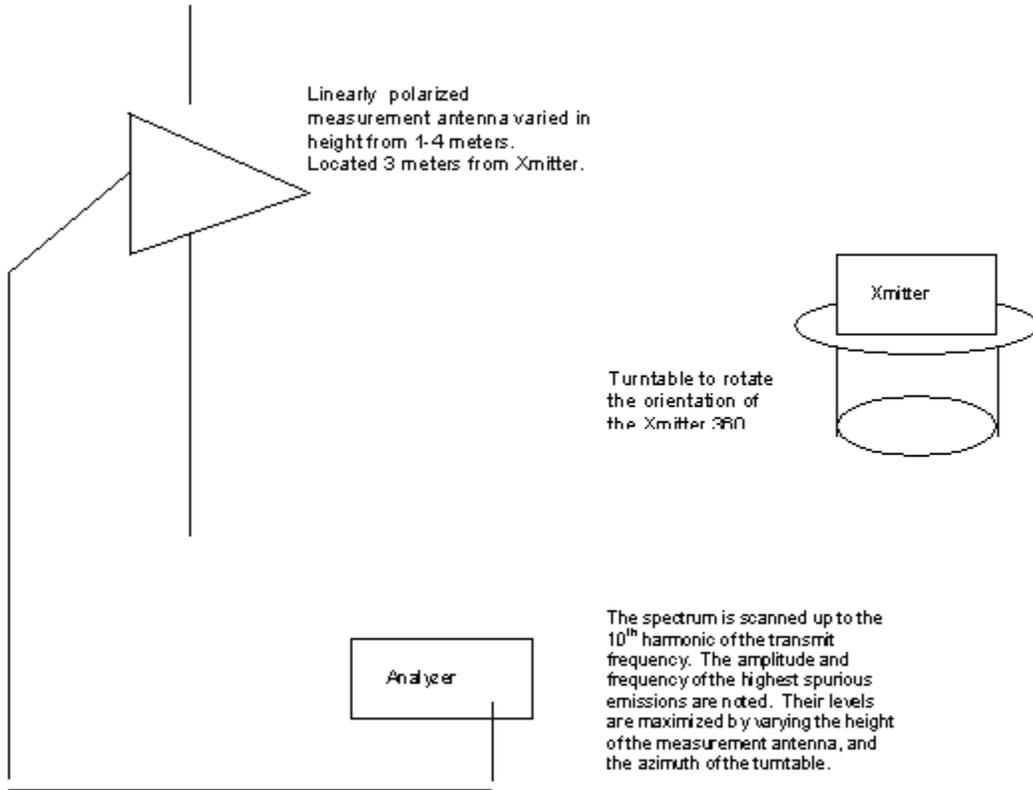
At an approved test site, the transmitter is placed on a remotely controlled turntable, and the measurement antenna is placed 3 meters from the transmitter. The turntable azimuth is varied to maximize the level of spurious emissions. The height of the measurement antenna is also varied from 1 to 4 meters. The amplitude and frequency of the highest emissions are noted. The transmitter is then replaced with a ½ wave dipole that is successively tuned to each of the highest spurious emissions. A signal generator is connected to the dipole (horn antenna for frequencies above 1 GHz), and its output is adjusted to match the level previously noted for each frequency. The output of the signal generator is recorded, and by factoring in the cable loss to the dipole antenna and its gain; the power (dBm) into an ideal ½ wave dipole antenna is determined for each radiated spurious emission.

Bandwidths Used for Measurements

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 – 0.15	1.0	0.2	0.2
0.15 – 30.0	10.0	9.0	9.0
30.0 – 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

Measurements were made using the bandwidths and detectors specified. No video filter was used.

Test Setup Diagram



*

Completed by:

Pauline Le Pelley

Apparent Power Data Sheet

EUT:	MC Series	Work Order:	RAFN0042
Serial Number:	Engineering Production Unit #1	Date:	10/20/04
Customer:	Radioframe Networks, Inc.	Temperature:	70
Attendees:	Dean Bush	Humidity:	45%
Cust. Ref. No.:	N/A	Barometric Pressure:	29.61
Tested by:	Rod Peloquin	Power:	-48VDC
		Job Site:	EV01

TEST SPECIFICATIONS	
Specification:	47 CFR 90.691 and 2.1053
Method:	TIA/EIA-603
Year:	2003
Year:	2001

SAMPLE CALCULATIONS	
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation	
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator	

COMMENTS

EUT OPERATING MODES
20 channels configured in sector omni mode radiating into dummy loads

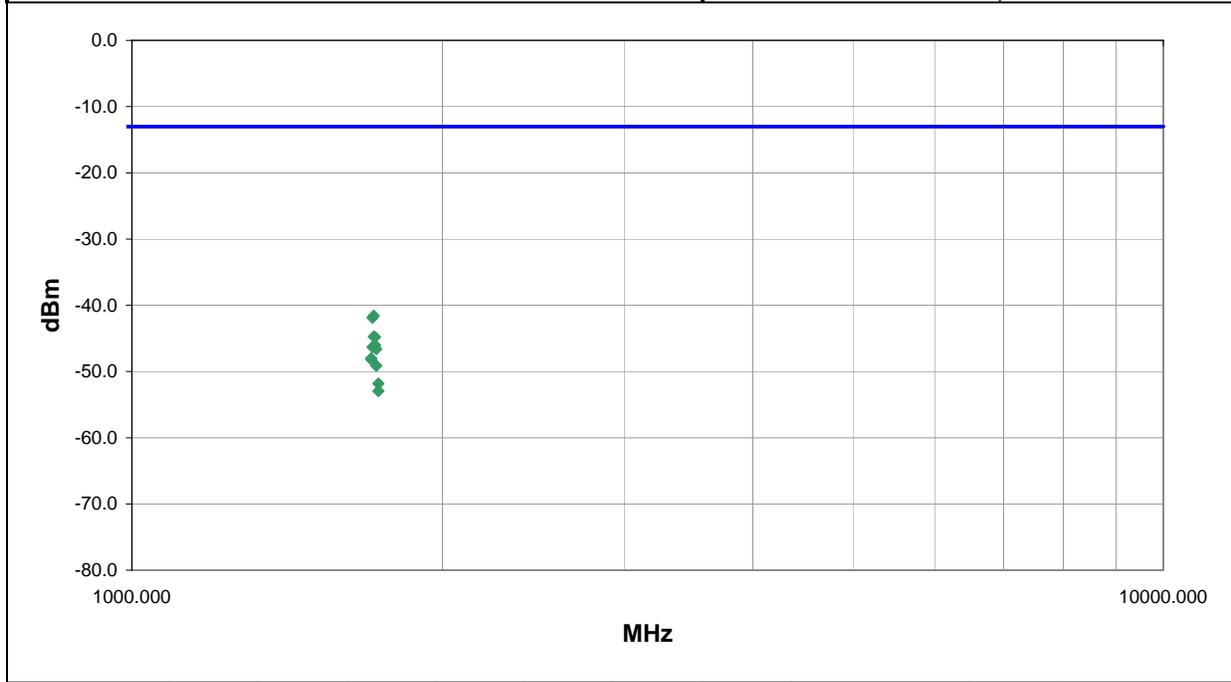
DEVIATIONS FROM TEST STANDARD
No deviations.

RESULTS	Run #
Pass	1

Other



 Tested By:



Freq (MHz)	Azimuth (degrees)	Height (meters)	Polarity	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)
1716.048	156.0	1.2	V-Horn	PK	0.0000	-41.6	-13.0	-28.6
1711.102	156.0	1.4	V-Horn	PK	0.0000	-41.9	-13.0	-28.9
1716.048	161.0	1.3	H-Horn	PK	0.0000	-44.7	-13.0	-31.7
1721.000	48.0	1.1	V-Horn	PK	0.0000	-44.8	-13.0	-31.8
1721.000	230.0	1.3	H-Horn	PK	0.0000	-46.0	-13.0	-33.0
1711.102	91.0	1.3	H-Horn	PK	0.0000	-46.3	-13.0	-33.3
1725.947	103.0	1.1	V-Horn	PK	0.0000	-46.6	-13.0	-33.6
1706.148	103.0	1.7	H-Horn	PK	0.0000	-48.0	-13.0	-35.0
1706.148	152.0	2.8	V-Horn	PK	0.0000	-48.2	-13.0	-35.2
1725.947	242.0	1.5	H-Horn	PK	0.0000	-49.1	-13.0	-36.1
1733.371	163.0	1.2	V-Horn	PK	0.0000	-51.8	-13.0	-38.8
1733.371	180.0	1.2	H-Horn	PK	0.0000	-52.9	-13.0	-39.9

Apparent Power Data Sheet

EUT:	MC Series	Work Order:	RAFN0042
Serial Number:	Engineering Production Unit #1	Date:	10/20/04
Customer:	Radioframe Networks, Inc.	Temperature:	70
Attendees:	Dean Bush	Humidity:	45%
Cust. Ref. No.:	N/A	Barometric Pressure:	29.61
Tested by:	Rod Peloquin	Power:	-48VDC
		Job Site:	EV01

TEST SPECIFICATIONS	
Specification:	47 CFR 90.691 and 2.1053
Method:	TIA/EIA-603
Year:	2003
Year:	2001

SAMPLE CALCULATIONS
 Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation
 Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

EUT OPERATING MODES
 20 channels configured in sector omni mode radiating into dummy loads

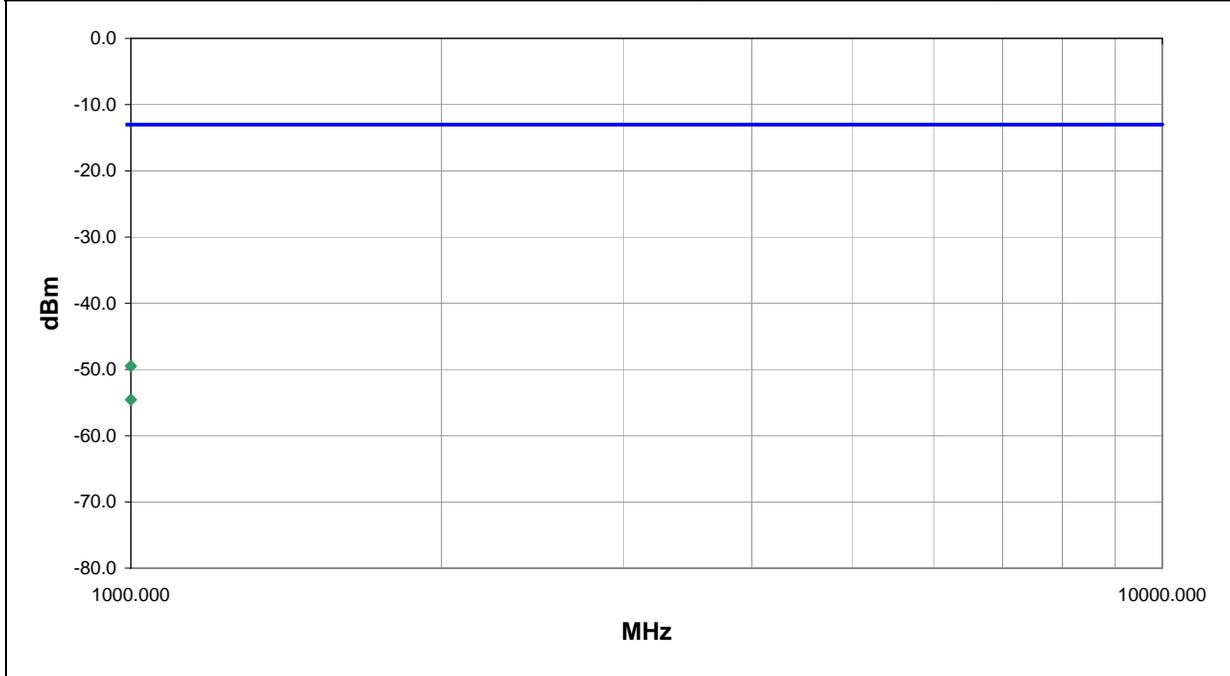
DEVIATIONS FROM TEST STANDARD
 No deviations.

RESULTS	Run #
Pass	2

Other



 Tested By:



Freq (MHz)	Azimuth (degrees)	Height (meters)	Polarity	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)
1000.004	349.0	1.5	V-Horn	PK	0.0000	-49.5	-13.0	-36.5
1000.004	201.0	1.3	H-Horn	PK	0.0000	-54.6	-13.0	-41.6

Apparent Power Data Sheet

EUT:	MC Series	Work Order:	RAFN0042
Serial Number:	Engineering Production Unit #1	Date:	10/20/04
Customer:	Radioframe Networks, Inc.	Temperature:	70
Attendees:	Dean Bush	Humidity:	45%
Cust. Ref. No.:	N/A	Barometric Pressure:	29.61
Tested by:	Rod Peloquin	Power:	-48VDC
		Job Site:	EV01

TEST SPECIFICATIONS	
Specification:	47 CFR 90.691 and 2.1053
Method:	TIA/EIA-603
Year:	2003
Year:	2001

SAMPLE CALCULATIONS
 Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation
 Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

COMMENTS

EUT OPERATING MODES
 20 channels configured in sector omni mode radiating into dummy loads

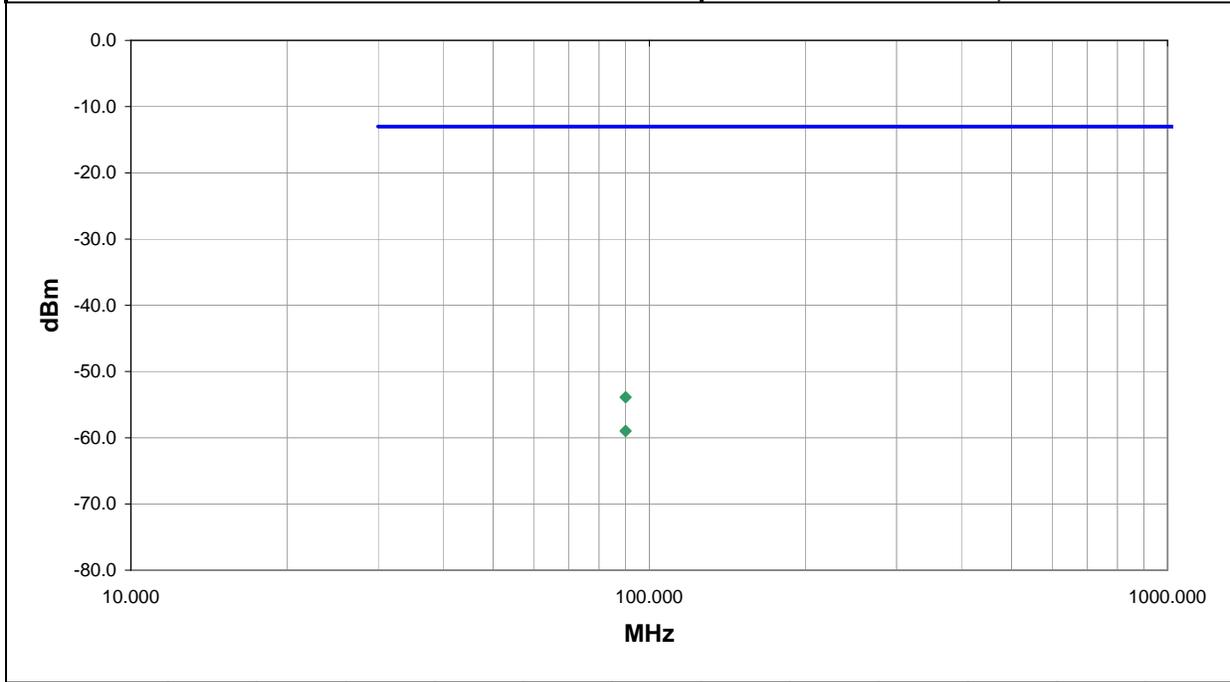
DEVIATIONS FROM TEST STANDARD
 No deviations.

RESULTS	Run #
Pass	3

Other



 Tested By:



Freq (MHz)	Azimuth (degrees)	Height (meters)	Polarity	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)
90.003	160.0	1.0	V-Bilog	PK	0.0000	-53.9	-13.0	-40.9
90.003	151.0	1.6	H-Bilog	PK	0.0000	-59.0	-13.0	-46.0

